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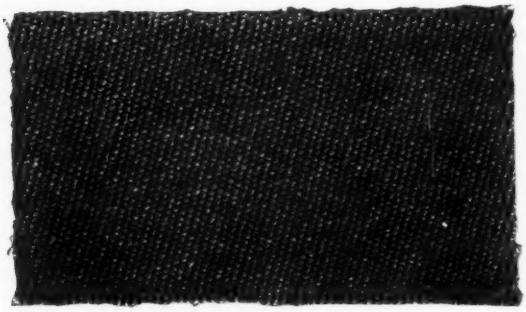

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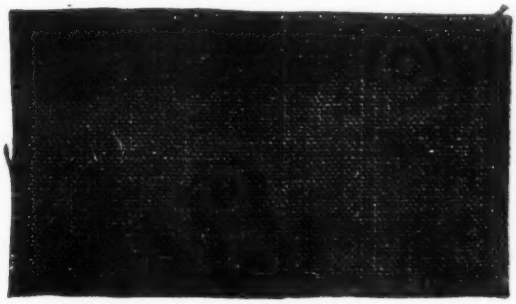

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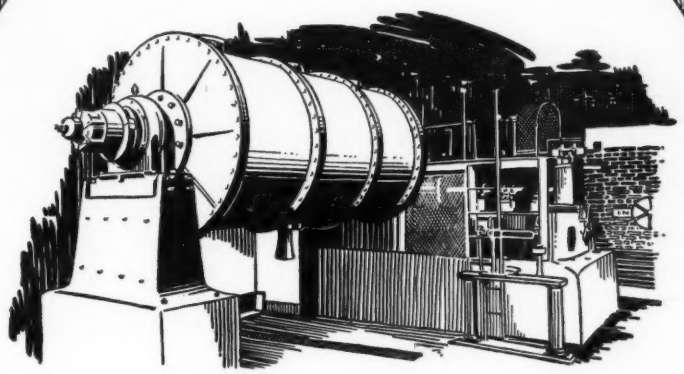

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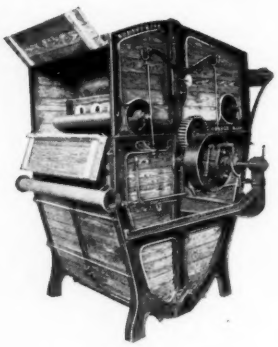

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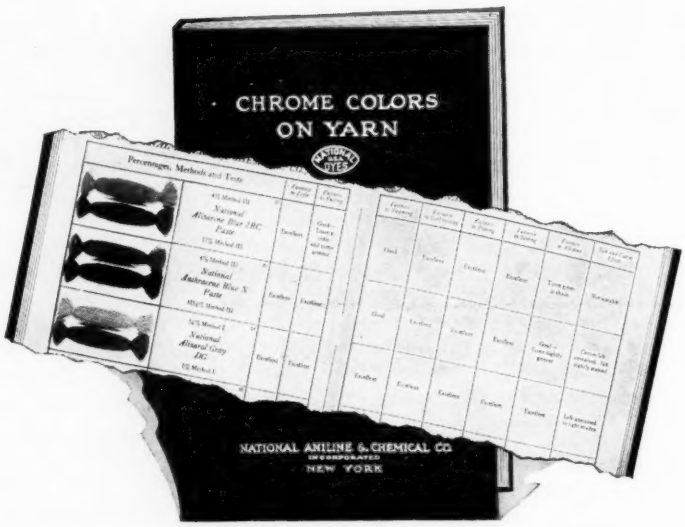

The second edition of the "National" color card "Chrome Colors on Yarn," just completed, is issued to make the information as to the chrome dyes produced by the National Aniline & Chemical Company, Inc., more comprehensive and complete than was offered by the first edition.

The three chrome processes, ortho chrome, after-chrome and chrome bottom methods, are separately treated in the text.

Probably the most important feature in this card is the separate listing of those "National" Chrome colors particularly suitable for machine dyeing, for best fastness to milling and to carbonizing, for production of combination shades, for leaving cotton effects and silk effects unstained, for dyeing in copper and in iron machines and for subsequent shading of dyeings.

Following each dye is a tabulation showing reaction of the particular shade to each of eight fastness tests.

The samples themselves are arranged in knots so designed that the velvet test on the ends can be easily made and are so tied that threads can be easily withdrawn for matching purposes.

At the end of the color card samples of shades obtained by the three standard methods of chrome dyeing are given in a separate division.

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VOLUME XI NEW YORK, SEPTEMBER 25, 1922 NUMBER 7

Chemical Control of Dyestuffs

Analytical Procedure—Four Methods—Tests on Orange II, Victoria Blue B and Chrysophenine G—Manipulation and Results—Maintaining Standards by Combination of Methods

By WALTER M. SCOTT, PH.D.

Cheney Bros., South Manchester, Conn.

A paper presented at the A. C. S. Dye Division Fall Meeting

Introduction

In view of the fact that the title of this paper is somewhat ambiguous, a few words of explanation may be of value at the present time. The writer is not attempting to approach the subject from the standpoint of the manufacturer of dyestuffs, but entirely as a consumer. The basis of this discussion will be, therefore, the question as to how much a chemical analysis may assist in solving the problems of the man who is interested in the purchase of dyestuffs for application to textile fibers.

In this connection there are three distinct problems to be considered. In the first place, there is the necessity of choosing the right dye for the right place, in order to obtain the desired color effect which shall possess such fastness to light, washing, etc., as demanded by the ultimate consumer of the goods. This is not essentially a chemical proposition, and therefore has no place in this particular paper.

Having selected and adopted a certain type of color for a certain definite purpose, there is, secondly, the question of picking the best representative of this type on the market from the standpoint of concentration versus price; and, thirdly, all subsequent shipments of this color must be tested to see that the original standard is maintained. It is here that the chemical laboratory can play an important role and, in conjunction with the standard dye test, with which every dyer is familiar, act as a safeguard for the dyehouse.

Analytical Procedure

In the following paragraphs four methods of analysis will be described, namely: (1) The so-called calorimetric comparison of dyestuff solutions; (2) the titration of a solution of known strength with titanous chloride; (3) the estimation of nitrogen by the Kjeldahl method; and (4) the quantitative determination of substances other than dyestuff.

The first-mentioned method, of course, does not involve any complicated chemical process and is undoubtedly familiar to all dye chemists. It consists simply in comparing a solution of the unknown dye with a solution of the standard for its particular type. This may be done in any of the well-known forms of apparatus designed for this purpose, or more simply still by the use of two Nessler tubes so placed that they receive equal illumination from a standard source of light. The stronger of the dye solutions is diluted with water until it matches the other, and from the proportion of dyestuff in each solution a percentage ratio of strength may be obtained.

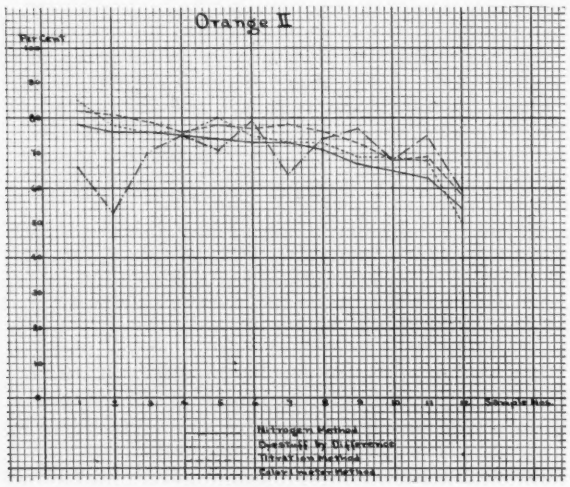
The titanous chloride titration has been described by a number of authors since it was originally proposed by Knecht. In brief, it consists in dissolving a definite amount of dyestuff in water, acidifying the solution, and then adding a standard solution of titanous chloride in an atmosphere of carbon dioxide until complete reduction takes place, the end point being indicated by the disappearance of the original color. In a large number of cases, however, it has been found preferable to add an excess of titanous chloride, boil the solution for about one minute, and then titrate the excess with ferric alum, using a thiocyanate indicator. It must be said in this connection that it is necessary to work out for each type of color the best modification to be used.

The Kjeldahl method for nitrogen is a very common type of chemical analysis, and yet the writer is not aware that it has ever been mentioned in connection with the estimation of the strength of dyestuffs. It is well known that practically all of the coal-tar colors have a definite composition and contain a fixed amount of nitrogen. Inasmuch as none of the chemicals commonly used in standardization contains this element in any form, the percentage of nitrogen serves as a good indicator of the actual amount of dyestuff present. It is possible to determine this percentage of nitrogen in any type of dyestuff quite

accurately by the Kjeldahl method, and thereby to calculate the strength of that particular sample.

The fourth method is not so useful as a primary method of analysis, but has very interesting possibilities in the way of serving as a check on the other determinations. A large proportion of the aniline colors are standardized either with sodium chloride or sodium sulphate, and so if we estimate the amount of these two salts which are present we may infer that the remainder consists of straight dyestuff. It was found very easy to make a quantitative determination of sodium chloride by igniting carefully until the organic matter was thoroughly charred, dissolving the residue in hot water and titrating with silver nitrate. The best results were obtained when the aqueous solution of the ash was acidified with nitric acid, an excess of silver nitrate added, and the remainder nitrated with thiocyanate, using ferric alum as an indicator.

In order to determine sodium sulphate, the dyestuff was ignited as above and the residue dissolved in water. In this case the solution was filtered in order to remove the charred particles, and then the sulphate was precipitated with barium chloride in the usual manner. It is necessary to exercise some care during the burning of the dye in order that some of the sulphate may not be lost by reduction to sulphide. Some experimental work has been done with a view to the prevention of this loss by the addition of an oxidizing agent before ignition. A considerable study along this line is contemplated and may form the basis for a later paper.



ORANGE II

Schultz No. 145; Composition $C_{16}H_{11}N_2SO_4Na$; Theoretical Percentage of Nitrogen 8%

Sample No.	% N	% NaCl	% Na_2SO_4	% Color (a)	—% Color Calculated— From N	By Diff.	From Titra.	From Colorim. (b)
1.....	6.21	1.96	13.24	88	78	85	82	66
2.....	6.07	....	22.46	70	76	78	81	53
3.....	6.04	....	24.27	93	76	76	79	70
4.....	5.97	....	24.69	100	75	75	76	75
5.....	5.95	2.64	17.85	95	74	80	78	71
6.....	5.85	11.64	13.20	105	73	75	77	79
7.....	5.85	4.11	22.55	85	73	73	78	64
8.....	5.66	....	27.12	98	71	73	76	74
9.....	5.39	....	30.88	103	67	69	73	77
10.....	5.17	13.00	17.61	90	65	69	68	68
11.....	5.07	12.45	19.65	100	63	68	69	75
12.....	4.35	35.62	14.69	78	54	50	58	59

(a)Compared in colorimeter with sample No. 4 as 100%.
(b)Calculated to compare with No. 4 as 75%.

Discussion

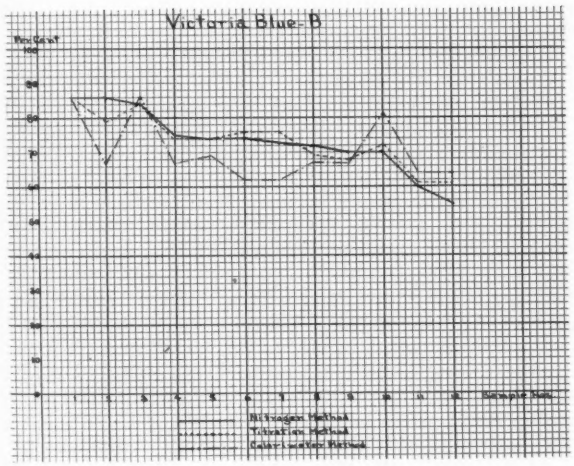
For the purpose of illustrating the value of these various methods, three colors were chosen: Orange II, representative of the so-called acid dyeing group; Victoria Blue B, a typical basic dye of the triphenyl methane series; and Chrysophenine G, a member of the family of direct cotton colors. Twelve different samples of each type were obtained from the various sources of supply and analyzed according to the methods described above. The results of these analyses are listed in the three tables which accompany this article, and are also pictured graphically in order to bring out more clearly the comparison of one to the other. For charting purposes, the samples were grouped in the order of their various nitrogen percentages, No. 1 being the highest.

It was soon found that the colorimeter method was very unsatisfactory in its application. It was practically impossible to use it with any degree of certainty for a color like Chrysophenine G, where slight differences in hue were apt to be interpreted as variations in strength. Even the mixing of this and other yellows with a definite amount of blue did not serve to make the comparison much more accurate. It was anticipated that a color like Victoria Blue B would serve as the best model for this type of analysis, but even here most of the samples showed a wide variation from the nitrogen results, the maximum being 19 per cent.

The titration with titanous chloride, if properly worked out and controlled, can be used with a much greater degree of success, although it also has its limitations, as will undoubtedly be shown in another paper which is to be presented before this meeting. In the case of Victoria Blue B it was only possible to obtain a comparative titration by dissolving the dye in dilute alcohol and adding titanous chloride to the boiling solution in the presence of Rochelle salt until the blue color disappeared. Unfortunately, the destruction of the blue color is not permanent and it returns very quickly, so that the speed of the titration is an important factor. However, by adopting one sample as a standard and running a check titration against this standard just before testing the unknown, it was found possible to obtain quite satisfactory results. If the strength of the standard has been carefully determined by some other method, the actual strength of the unknown may be calculated.

The setting aside of one sample as a standard is recommended even when it is possible to standardize the titanous chloride against ferric alum. The chances of error due to a change in operatives or some other variation of procedure are thereby considerably lessened, for if the standard is first run as a blank it is much easier to make the subsequent titration of the unknown in an exactly similar manner.

It is interesting to note that in the case of Orange II the maximum variation between the titanous chloride titration and the nitrogen estimation was 6 per cent, while the average variation was 4.2 per cent. With Victoria Blue B, the maximum variation was 7 per cent and the average 2.25 per cent. When it is considered that in actual dyeing the minimum variation in strength which can be detected is about 5 per cent for blue shades and even higher for yellows, the accuracy of the titration method seems quite sufficient in these two cases. Somewhat greater difficulty was experienced with the Chrysophenines, particularly in the higher concentrations where variations as high as 11 per cent were obtained.

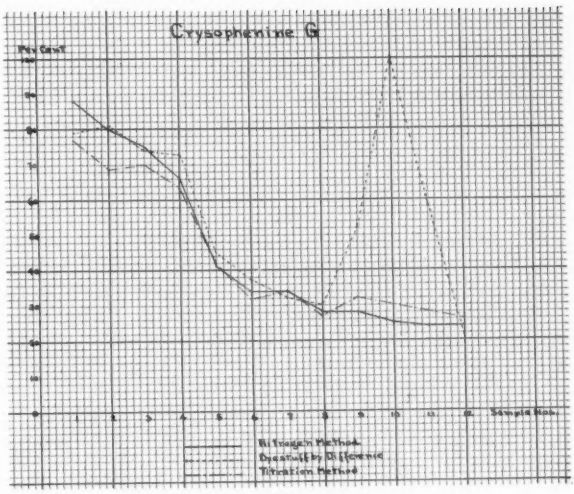


VICTORIA BLUE B

Schultz No. 559; Composition $C_{33}H_{32}N_2Cl$; Theoretical Percentage of Nitrogen 8.31%

Sample No.	Analyses: % N	Analyses: % Color (a)	% Color Calculated: From N	From Titra. (c)	From Colorim. (b)
1.....	7.11	100	86	86	86
2.....	7.10	78	86	79	67
3.....	6.95	100	84	84	86
4.....	6.22	78	75	74	67
5.....	6.19	80	74	74	69
6.....	6.15	72	74	76	62
7.....	6.04	72	73	76	62
8.....	6.00	78	72	69	67
9.....	5.88	78	70	68	67
10.....	5.82	94	70	72	81
11.....	4.97	74	60	61	64
12.....	4.53	74	55	61	64

(a)Compared in colorimeter with sample No. 1 as 100%.
(b)Calculated to compare with No. 1 as 86%.
(c)Solution standardized against sample No. 1 valued at 86% color.



CHRYSOPHENINE G

Schultz No. 304; Composition $C_{30}H_{26}N_4S_2O_8Na_2$; Theoretical Percentage of Nitrogen 8/24%

Sample No.	Analyses: % N	Analyses: % NaCl	Analyses: % Na_2SO_4	—% Color Calculated— From N	By Diff.	From Titra.
1.....	7.21	2.93	17.79	88	79	77
2.....	6.62	....	18.78	80	81	69
3.....	6.16	12.37	13.79	75	74	70
4.....	5.41	7.00	20.04	66	73	64
5.....	3.39	2.66	52.54	41	45	42
6.....	2.79	5.38	58.05	34	37	32
7.....	2.78	36.56	31.37	34	32	34
8.....	2.30	4.46	65.11	28	30	27
9.....	2.30	41.76	6.57	28	52	32
10.....	2.07	....	....	25	100	30
11.....	2.01	3.42	59.36	24	59	28
12.....	1.99	74.35	4.97	24	21	26

The nitrogen method has proven in actual practice to be more widely applicable than any of the others, and is only of doubtful value where the percentage of nitrogen is so low that small variations would be magnified into large differences in the calculated strengths of the samples.

The fourth method of analysis was entirely in applicable to the samples of Victoria Blue B, and also to several of the samples of Chrysophenine, because of the fact that they were not standardized with sodium chloride or sodium sulphate, but with some other material such as dextrine, or possibly normal sodium phosphate. With the acid orange, however, it was quite successful, the maximum variation from nitrogen being 7 per cent and the average 2.75 per cent. In the Chrysophenine group, with the exception of the three samples which were completely out of line, the maximum variation was 9 per cent and the average 3.8 per cent.

It has not yet been determined just what influence the presence of sulphuric acids in the dyestuff itself has upon the results obtained. However, it can be seen that, from a practical standpoint, they do not have a sufficient effect to mar the value of this determination. At all events, their effect is constant, and it is the variations from type which we are interested in.

Summary

1. Four methods for the estimation of the strength of dyestuffs have been described, two of which were entirely new for this type of work.

2. It has been shown that three of these are suitable for the testing of a typical acid color, while two—the titration and the nitrogen methods—are applicable to the representative basic color. Only one—the nitrogen analysis—is entirely satisfactory in connection with the particular sample of the direct type which was chosen for experiment, although the indirect method was useful in a number of cases. It might also be mentioned that the titration method has been used quite successfully with a number of other direct colors.

3. It can be definitely stated, therefore, that a combination of these various chemical methods can be of very great assistance toward the economical purchase of dyestuffs and the maintenance of the original standard in each individual shipment.

Acknowledgment

Acknowledgment is made to Henry Leupold and Harry I. Bashlow, of the laboratory of Cheney Bros., for their able assistance in obtaining the data for this paper.

German Flax and Research

Economic Revival of Europe—Trend Towards Modern Methods—Production of Flax in Germany Centers Around Sorau—The Research Institute at Sorau and Its Purpose—Staff and Equipment—Ground Covered—The Textile School—Theory and Practice Well Covered —Need of Fundamental Research Emphasized Anew

By CHARLES F. GOLDTHWAIT

Chief Chemist, Klearflax Linen Rug Company, Duluth, Minn.

PUTTING aside all considerations that have arisen from the late war, it is of interest to know something of just what is happening in Germany. One of the most significant facts is that in the face of financial and political disturbances the people are *working*. Numerous reports have appeared from visitors to that country on the purchase or sale of goods—but less on technical developments—which may eventually have far more influence on future relations than the more or less accidental circumstances of present commerce.

The writer has selected the subject of flax simply because he had an exceptional opportunity for observation, and has tried to present the matter in an entirely unbiased way, believing that it is more or less typical of the developing economic revival.

Progress Brought About by the War

As is very well known, Europe has been raising and preparing flax for hundreds of years with very little change in methods, which latter naturally seem out of date according to present standards. In recently visiting flax districts of several foreign countries the writer was impressed, however, by an undercurrent of progress or, we may say, a tendency toward modernism. This was especially true in Germany, where the exclusion from sources of cotton supply during the war, and unsatisfactory experiences with substitute textiles, have apparently brought home the value of flax.

There is progress in other countries, and it is true that a Linen Industry Research Association has been organized with headquarters at Belfast. In Germany, however, there is already such an institute, and it has been reporting scientific work for several years. There are many evidences of the great interest in the development of this local industry. For one thing, a campaign of education has been conducted and motion pictures were seen dating back to the time when Russian prisoners were pulling flax under German "foremen," who marched up and down the field with rifles. Such films have been in use covering all the steps of the linen industry.

Sorau a Flax Center

While flax is raised more or less throughout Germany, a considerable part of the industry centers around Sorau, in Nieder Lausitz, about 125 or 150 miles southeast of Berlin. This is a town which can be compared in many respects with Lille, the flax center of northern France.

Sorau, with a population of 17,000, has two flax spinning mills, a research institute for bast fibers, a textile school specializing in flax, testing laboratories for the bast

fiber industry, the main office of one of the bast fiber trade associations, several machine shops making miscellaneous mill supplies, as well as flax pullers, hemp breaks, and so on.

It is also the headquarters of Dr. Henry Schneider, a leading textile engineer, who has been instrumental in bringing about numerous flax developments: for example, a flax retting system which embodies the essential features of the warm water retting process and at the same time certain desirable features of the old-style river retting.

Sorau is obviously a quite diversified flax town, and is a good example of the mixing of the ancient and the modern. It is said to have existed as far back as 840, and along with modern manufacturing plants and the development of new scientific ideas we find a church of 1204, a castle of 1207 and a town hall of 1260.

We are already familiar with the large textile research projects in England, and since we can see beginnings of something of the same sort here at home this typical German enterprise may prove instructive and suggestive. Even though our own linen industry is too small to support such an organization, the same principles can be applied in other work.

Objects of the Institute at Sorau

The purpose of the Institute is the study of all bast fibers of domestic or foreign origin, from the seed not only to the prepared fiber but to the ultimate products made from it. Since flax is a great local industry, it naturally gets an extra large share of attention.

The laboratory of the Forschungs-Institute fur Bastfasern is very pleasantly situated, and is so surrounded by shade trees that it was difficult to get a good photograph. The building was formerly part of an insane asylum—which fact may have some significance, as such a retreat may be considered quite suitable for those who have lingered too long in the flax game! At any rate, the building has been admirably adapted to its present purpose.

Bast Fiber Research Institute, Sorau, Germany

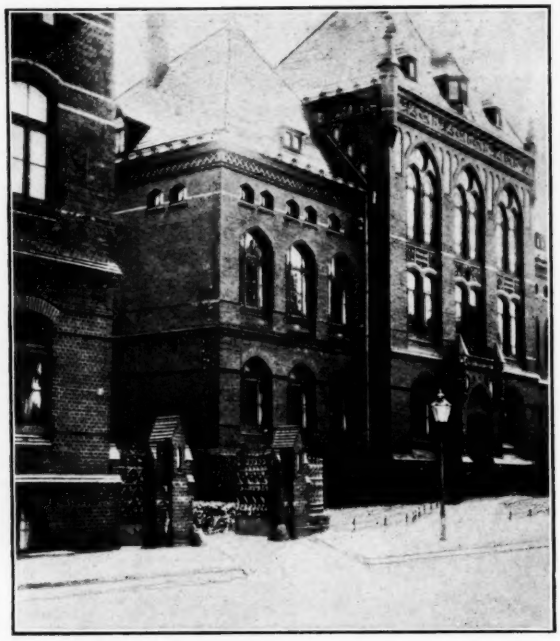
Flax Retting and Preparing Association Headquarters, Sorau, Germany

The staff consists of about fifteen, half of whom are able scientific men and the rest well-qualified assistants.

The equipment, besides the various botanical, biological and chemical laboratories, and rooms for microscopy and photography, includes retting tanks in the basement and out-of-doors, a greenhouse so that more than one generation of flax can be raised in a year, and garden plots and fields ample for both raising flax and for field retting. There is a good library, and one of the places of special interest is a museum showing a great variety of fibers, fabrics and charts showing the results of various studies. Parts of this display are sent to textile expositions and used for other educational purposes.

Ground Covered by the Institute

So far the work has been largely biological, starting with cultural methods and the breeding of the flax plant. Typical problems are comparisons of different varieties of flax and hemp, examinations of seeds for per cent germination, comparisons of seed-cleaning machinery, systematic plant breeding and the furnishing of special raw materials, as flax straw, hemp and other plants, to the other departments of the Institute.



Textile School, Sorau, Germany

The botanical division has also a broad field for its activities, for it considers plants in the living as well as in the dead state as raw materials for the textile industries. For example, it has long been known that the technical properties of fibers for spinning depend on anatomical, chemical and structural features of the fiber. The microscopic work gets to the bottom of these questions by referring manufacturing properties or faults in yarn or cloth directly back to their causes in the plant itself. Other lines are the identification of fibers in various textiles, the examination of proposed new fibers, as well as new investigations on the old ones, work on agricultural machinery and machines for recovering fiber from the plants; and especially the different kinds of flax and hemp and the diseases of fiber plants.

There is also complete equipment for bacteriological studies. Many problems await solution in the bacteriology of retting: for example, the activities of the bacteria concerned in field retting, comparisons of various kinds of retting, the course and control of the process, and the prevention of over-retting.

Oddities Encountered in Research

The activities of the chemical division are closely connected with those of the others, including as they do the study of fertilizers, soil analysis, research on pectin, that indefinite chief constituent of flax gum; research on the color of scutched flax that has been retted in different ways, the use of mineral oils in spinning, bleaching and finishing, and studies for the better utilization of card waste based on chemical reactions.

As in all other research, many odd and interesting things are encountered, among them being even such humble affairs as the parasites, diseases and the weeds common to flax fields. A peculiar parasite is flax silk, a small twining vine that draws its nourishment directly from the flax plant rather than from the ground. An interesting weed is flax dodder, which at first glance looks just like a flax plant except for the shape of the seed bolls; but unfortunately it has no fiber.

The Carboni retting process has been mentioned frequently in textile literature. It has proved very successful for Italian hemp, but not for flax. Since it is supposed to offer advantages over the other well-known process, the Rossi, which depends on deliberately making up the bacteria, its study is being taken up to see if the desired practical conditions can be worked out.

Another much-needed enterprise is the preparation of standards for different grades of flax. The need and the difficulty are both easily perceived in the case of such a variable commodity.

Owing to the neighborliness of the near-by textile school, it has not been necessary to extend the research equipment to practical manufacturing units. If their large and varied equipment is not sufficient, it appears to be quite easy to arrange for large-scale tests in one of the near-by mills.

Results of the Sorau researches and similar material from other German sources are being published regularly in "Faserforschung," edited at the Institute and acknowledged to be one of the best sources of scientific information on bast fibers.

Assuming that economic conditions are right, the Research Institute will be a great aid in developing a strong linen industry, no small factor in success being the close co-operation with manufacturing plants.

The Textile School

The textile school, which is known officially as the Preussische Hohere Fachschule fur Textil-Industrie, is notable, as it specializes so closely on bast fibers with less attention to cotton or wool except where there is a definite connection with this first type of fiber. While the school is interesting, it is not essentially different from our own in its general plan. Since it is so favorably situated, however, it can start with flax culture and study the entire subject, from seed to finished piece, in both practice and theory. In fact, girl students can pursue their study still further into needlework and dressmaking.

The equipment consists of experimental and full-sized machinery, from retting tanks through flax and hemp breaks, scutching wheels, tow shakers, heckling machine, regulation tow and line machinery for carding, drawing and spinning, various kinds of hand and power looms, thread and rope machinery, and dyeing and finishing equipment, one of the more spectacular pieces of apparatus being a rope walk over 300 feet long.

(*Concluded on page* 247.)

MORDANTS

In Three Parts—Part II, Concluded

By WILDER D. BANCROFT
Professor of Chemistry, Cornell University

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Note—References will be found at the conclusion of this installment, p. 239

KNECHT[21] comments on these data as follows: "It is a prevalent opinion that when wool is boiled with aluminum sulphate, for instance, the salt is decomposed by the fibre in such a manner that aluminum hydrate and sulphuric acid are formed, of which the former is assimilated by the fibre, while the latter remains in solution. Others again assume that an insoluble basic sulphate of alumina is formed on or in the fibre. Quantitative determinations, carried out by Furstenhagen and Appleyard, show that when wool is boiled with a solution of alum no free acid remains in solution when the amount of alum does not exceed five percent of the weight of the wool. When larger amounts are used, a basic sulphate of alumina is fixed on the fibre. Now it has always been shown that wool possesses a considerable affinity for both acids and bases, and, in its whole behavior it evidences the properties of an amido acid—that is a substance possessing simultaneously basic and acid properties. This would explain in a satisfactory manner the fixation of both the acid and basic constituents of the alum, but in what form these are fixed still remains a matter of conjecture. It is not improbable that the phenomenon is due to actual chemical combination with the fibre or with certain constituents of the latter; just as lead or mercury, when absorbed by the system, enters into chemical combination with the albuminoids in the various organs. That a hydrate is not formed is conclusively shown in mordanting wool with copper salts. The fibre assumes a green color; but copper oxide, when boiled, is at once dehydrated and transformed into black copper oxide. If copper hydrate had been formed, the fibre would be black whereas it is green, and remains so even after prolonged boiling."

It has already been shown that Furstenhagen and Appleyard have not proved by quantitative determinations that a basic sulphate of alumina is fixed on the fibre. They have proved that both alumina and sulphuric acid are taken up by the fibre; but nothing more. Knecht seems to realize this unconsciously because he himself admits that it remains a matter of conjecture in what form the acid and basic constituents of the alum are fixed. That is true; but that is quite a different thing from showing what a basic aluminum sulphate is fixed on the fibre. Knecht's argument in regard to the copper hydrate is fallacious because hydrous copper oxide does not necessarily turn black when heated to 100°. Tommasi[22] showed that when a little hydrous manganous oxide is precipitated with the hydrous copper oxide, the latter does not turn black when boiled. Blucher and Farnau[23] found that a similar stabilization of the blue color could be obtained by adding hydrous oxides of nickel, cobalt, aluminum, chromium, and magnesium. With zinc there was some stabilization but practically none with mercury. If the blue color is due to the state of subdivision of the copper oxide, anything which will prevent it from agglomerating will keep it blue. Schenck[24] has shown that a mixture of the oxides of copper and alumina containing about five percent copper oxide can be heated in a blast lamp without turning black. Owing to the lower copper content the color is a light grayish blue. With ten percent copper oxide, the blue color was deeper and withstood heating in a Bunsen burner but showed signs of turning black wheu heated in the blast lamp. During the winter of 1920-21 Mr. R. K. Parsell repeated Mr. Schenck's experiments and, after heating, dissolved out as much alumina with caustic soda as he could without getting any blackening. In this way he was able to get a powder which was a beautiful deep blue and which contained approximately seventy-five percent cupric oxide and twenty-five percent alumina. If one insisted on writing a formula for this, it would be approximately $(CuO)_4 Al_2O_3$ which is rather absurd. There are not only no indications of a definite chemical compound; but, after standing for a year the powder has changed from blue to green. We do not know whether it will go black in time or not.

According to Havrez[25] and to von Georgievics[26] the amount of sulphuric acid taken up by wool from an aluminum sulphate or an alum bath increases relatively to the wool at high concentrations until at twenty-four percent alum referred to the wool, the alumina and the sulphuric acid are taken up in the same relative amounts as they occur in aluminum sulphate. At higher temperatures, relatively more sulphuric acid is taken up. I have never seen the original data and the abstracts are confusing and to some extent contradictory. Havrez[27] claims that with high alum concentration, the peptizing action of the alum on the alumina is so great that less alum is taken up than at lower concentrations. If this is true, the amount of alumina adsorbed passes through a maximum. On the other hand he apparently based his conclusion on the fact that wool mordanted in concen-

trated alum solutions did not dye to so deep a shade and this may be an effect of the sulphate taken up. Liechti and Hummel, however, "disagree with his assertion that an excess of alum acts like an acid which dissolves the alumina." Dreaper[28] who gets Havrez's name wrong, says that "Harvey pointed out in 1872 that in the case of very concentrated solutions of alum, more sulphuric acid than alumina is absorbed. This has been recently confirmed by von Georgievics. It appears that with a 24 percent solution of alum [referred to wool], and a proportion of water fibre of 30:1 alumina and sulphuric acid are taken up in their normal proportions. The affinity of wool for acid is stronger in dilute solutions and stronger for the alumina in strong solutions. The relative curves cross each other at 24 percent." There must be a misprint in the next to last sentence of this quotation, the words acid and alumina being transposed.

Havrez[29] states, and Liechti and Hummel confirm him that addition of acid (presumably sulphuric acid)[30] is beneficial with such low concentrations of alum as one percent on the wool. Since all the alumina is taken up at these concentrations, the object of adding the acid cannot be to increase the adsorption. The statement is made that with low concentrations of alum the bath becomes alkaline, in which case the acid is added to counteract this. It is not clear whether the alkalinity is due in the wool reacting with sulphuric acid, to ammonia going out from the wool, or to a partial adsorption of sulphuric acid from the potassium sulphate of the alum. This last hypothesis could be tested by running similar experiments with aluminum sulphate. Liechti and Suida[31] state that alum is not quite as good a mordant as aluminum sulphate, though the difference is not marked. This may seem to contradict their alleged previous statement that sodium sulphate increases the hydrolysis of aluminum sulphate on boiling; but the contradiction disappears if we postulate, which seems reasonable, that the sodium sulphate, though increasing the hydrolysis of the aluminum sulphate, also increases the relative amount of sulphuric acid taken up by the wool. The first would be beneficial and the second harmful and we do not know to what extent the two balance, or even whether this is the true explanation.

One objection to alum or aluminum sulphate as a mordant is that the sulphate coagulates the hydrolyzed salt so readily that very perceptible amounts of alumina or of basic salt are precipitated in the bath or on the wool in such a form that it rubs off. It seems as though this could be got round by heating the solutions more slowly. A simpler method of getting round this difficulty is to use aluminum salts of organic acids, which hydrolyze more readily than the sulphate because the acids are weaker, and yet which keep the colloidal alumina peptized in a finer form.

Adsorption of Aluminum Tartrate, Etc., by Wool

This was done more than a century ago by adding tartar (acid potassium tartrate) to a solution of alum.[32] "To impregnate wool or woolen cloth with the aluminous basis, it is commonly boiled in water, with from one-fourth to one-sixth of its weight of alum, and from one-twelfth to one-sixteenth of its weight of crude tartar, putting the latter first into the water, and, afterwards, the powdered alum: the heat of the water being gradually raised, is kept at the boiling point for an hour and a half, or two hours, during which the cloth is turned through the boiling liquor on a winch, that the mordant may be equally applied; and being afterwards taken out and drained, it is commonly left until the next day, and then rinsed in clean water, for dyeing. In the early collection of recipes, printed in 1605, and already mentioned, sour bran liquor is commonly directed to be employed in this way with alum; and it seems to have answered the purpose of tartar, which, when it came to be generally used in this way with alum; was supposed by the older dyers to do good by softening and correcting the acrimony of the latter: probably, however, the purposes which it answers, are not yet clearly ascertained; one of them seems to be, that of increasing the solubility of alum, and enabling it more completely and intimately to penetrate the fibres of the wool, with which it moreover enters into a permanent union, and thereby contributes efficaciously to modify, vary, and in some cases to brighten the colours with which it is employed, as will be seen hereafter."

Liechti and Suida[33] have studied the behavior of aluminum tartrate. Starting with an amount equivalent to eight percent aluminum sulphate, $Al_2(SO_4)_3.18\,H_2O$, referred to the wool, the whole of the alumina was fixed firmly on the wool. On treating the wool with hot water, the wash water became acid, showing that some tartaric acid was also taken up. The normal tartrate can be replaced without detriment by a mixture of one molecular weight of aluminum sulphate with 1.5-3.0 molecular weights of cream of tartar. If the normal tartrate is prepared by double decomposition, using the normal potassium sodium tartrate (Rochelle or Seignette salt) according to the equation,

$$2Al_2(SO_4)_3 + 6KNaC_4H_4O_6 = 2Al_2(C_4H_4O_6)_3 + 3K_2SO_4 + 3Na_2SO_4$$

the results were not as good as those obtained with the pure tartrate or with alum and tartar, in which latter case the bath contains some acid potassium sulphate in addition to the aluminum tartrate. "Since the general practical experience of dyers is that wool is better mordanted in an acid bath, it was thought possible, perchance, to replace the cream of tartar by an acid, sulphuric acid for instance. Experiment showed, however, that although a small addition of sulphuric acid (1 mol) increases slightly the amount of alumina absorbed by the fibre, it cannot replace the cream of tartar. Since the addition of a large amount of sulphuric acid (3 mols) yields very unsatisfactory colors although it hinders the dissociation of the mordant solution, it is evident that the beneficial action of

the cream of tartar cannot be ascribed merely to its retarding the dissociation of the mordant." The explanation undoubtedly is that the use of tartrate cuts down the degree of adsorption of the sulphuric acid.

"An experiment was made accordingly with a view to determining whether the tartaric acid used along with aluminum salts played the role of a carrier, so that it might be possible to use any free acid along with only a small quantity of tartaric acid. The result obtained, however, proved that the tartaric acid plays no such intermediary part in mordanting wool with aluminum salts; on the contrary, a considerable amount of tartaric acid must be present (at least half the theoretical amount necessary to form aluminum tartrate) in order to fix on the wool sufficient alumina to yield full, bright colours."

Knecht[34] evidently believes in starting with aluminum sulphate. "The aluminum mordant *par excellence* for wool is aluminum sulphate, either alone or in conjunction with acids or acid salts. In some cases the sulphate is used without any additions. Most generally, however, a mixture of the sulphate with tartar or tartar substitutes is required to obtain full and brilliant colours which do not rub off. These tartar substitutes are mostly sodium bisulphate or oxalates, or they consist of tartar which has been prepared with sufficient sulphuric acid to convert all the potassium into potassium sulphate. From the foregoing it appears that none of these 'substitutes' can replace the tartar completely because the action of the latter depends on the formation of aluminum tartrate by double decomposition. They have, of course, some effect, as has also sulphuric acid. For a full shade about 6 to 8 percent aluminum sulphate and 5 to 7 percent tartar (of the weight of the wool) are necessary. The quantity of tartar may be reduced to about half this amount, or it may be partly or even wholly replaced by sulphuric, hydrochloric, oxalic acid, bisulphate of sodium, etc., with very good, although not equally fine, results. About 4 percent of sulphuric acid (of the weight of the wool) is used, if the amount of water does not exceed 50 to 60 times the weight of the wool; otherwise more acid must be applied. When sulphuric acid has been used in mordanting it is often beneficial to add about 5 per cent sodium acetate to the ultimate dye-bath to neutralize the mineral acid which always remains in the wool fibre (and which otherwise would be converted into postassium sulphate if tartar had been employed). The mordanting bath is prepared with the necessary quantities of aluminum sulphate and tartar (or its substitutes), and the wool is entered at a low temperature. During one and a half hours the bath is heated gradually to boiling, and boiled for half an hour more. When the bath has cooled down, the wool is taken out and thoroughly washed in water; boiling out with water is beneficial. It has been shown that washing is absolutely necessary to remove all loosely adhering mordants and to prevent rubbing of the ultimate colour. The washing, moreover, removes some of the acid, which is absorbed by the wool, and would be injurious in dyeing."

I am inclined to believe that accurate experiments will show that the presence of sulphate in the mordanting bath is probably always detrimental.

Aluminum oxalate behaves very much like aluminum tartrate but is not quite so good. According to Knecht[35] aluminum acetate decomposes too readily to be used for wool; but this can hardly be the whole truth. The use of lactic acid instead of tartaric acid has also been suggested.

Matthews[36] has rather a hard time with the theory of mordants, chiefly because he copies with but slight changes from Ganswindt's book published in 1903. "The mordanting of the animal fibres with metallic salts is probably for the most part a chemical process, the metallic salts or oxide forming a chemical compound with the substance of the fibre. It is usually considered in the case of mordanting wool, for instance, with metallic salt, that the metal is precipitated in the fibre as the oxide or hydroxide; in certain methods of printing, this may be the fact, but in the ordinary processes of mordanting wool for dyeing, it cannot be considered that the oxide of the metal is directly precipitated in the fibre. It is possible, for instance, to mordant the wool by boiling in a bath containing a solution of alum, squeezing, and then passing through a bath containing ammonia water; this would cause the precipitation of aluminum hydrate on and in the fibre as an insoluble body. As an actual fact, however, the mordanting is not done in this manner, but is carried out by boiling the wool with a solution of alum and tartar, which it cannot be presumed would lead to the precipitation of aluminum hydrate."

Even with Ganswindt to fall back on in silence, this paragraph is quite extraordinary; but the clue is to be found elsewhere. Matthews[37] has evidently not understood any of the work of Liechti and Suida or of Knecht because he enters into an elaborate explanation that sodium chloride is dissociated electrolytically in water and thereby made more active, giving this as a help in understanding the theory of Knecht, although Knecht[38] himself speaks of hydrolytic dissociation, and the case that Matthews is discussing is the decomposition of rosaniline hydrochloride into the free base and hydrochloric acid, which is not a case of electrolytic dissociation.

Adsorption of Alumina by Silk

Silk behaves towards alumina mordants very much as wool does, though less intensely. Knecht[39] states that "in silk dyeing alum has not been replaced yet by aluminum sulphate[40] probably owing to the circumstance that slightly basic alum decomposes more readily than basic sulphate on account of the ammonium or potassium sulphate present. . . . Aluminum sulphate-acetate and nitrate-acetate are used in a similar way. . . . During the steeping process the silk absorbs basic sulphates or basic sulphate-acetates or nitrate-acetates. By the subsequent treatment with water or silicate of soda or soap the basic salts are decomposed and aluminum hydroxide is precipitated in the fibre." Heermann[41] claims to have proved that, with silk, the basic mordants of aluminum, chro-

mium, iron, and tin are present as hydrous oxides and not as basic salts. Heermann[42] has discussed the various theories of mordanting and mentions favorably what he calls the catalytic theory according to which the fibers bring about the hydrolytic decomposition of the mordanting salts catalytically. It is easy enough to see what he has in mind, for the hydrolysis of the aluminum salts is increased by wool or silk; but this cannot properly be called catalytic because the fibre is not in the same condition after the process as before. It is mordanted.

Heermann also advances a theory of his own which he calls the ionatic theory of mordanting. He considers mordanting "as the electrolytic precipitation of certain ion complexes in consequence of the preponderating electro-affinity of the fibres (as opposed to that of the cations of the mordant) and in consequence of the [electrolytic?] dissociation of the mordant which is perhaps increased by the catalytic power of the fibres or of the cations of the mordant."

This can mean anything or nothing, so Heermann explains his views in more detail. "There are fibres of greater and lesser electro-affinity[43] and mordants of greater and lesser electrolytic dissociation. The affinity of a mordant to a fibre reaches its maximum when the greatest dissociation of the mordant coincides with the greatest difference between the electro-affinities of the fibre and of the ions of the mordant. The fibre, having the greater electro-affinity discharges successively the ions or ion-complexes of the mordant, since these have a lesser electro-affinity. The ion-complexes of the mordant, when thus discharged deposit themselves, while in the nascent, state, uniformly on the fibre and are at first held there in a labile state along with the acid. Washing removes most of the acid of the mordanting salt and the resulting base is fixed fast to washing." It is perhaps not surprising that no further use has been made of this theory even by the enthusiastic author.

Adsorption of Alumina by Cotton

Over a century ago it was pointed out[44] that "the attraction between aluminous basis and the fibres of linen and cotton is much weaker than that which subsists between the same basis and the fibres of wool and silk." The knowledge that alum cannot be used by itself to mordant cotton turns back to a very early period. Bancroft[45] states that "when a solution of alum is applied to calico which has received no impregnation, it will not easily be decomposed; but, on the contrary, a great part of it will again crystallize, so soon as the water which held it in solution has evaporated; and none but feeble colours can be raised upon such a basis. But when calico has been impregnated by such astringent and animal matters as are obtained from myrobalans and buffaloes' milk, the alum will not only be decomposed, but the alumine will combine with the astringent and oily matters so obtained, and a basis will be laid for a colour almost as durable as the Turkey red."

"For the common madder red, linen or cotton, after being boiled in a weak lixivium of potash or soda, and well rinced and dried, is to be macerated in a decoction of powdered galls, employed after the rate of four ounces to every pound of linen or cotton to be dyed; and being equally impregnated with the soluble matter of the galls and afterwards dried, the linen or cotton is to be alumed, by soaking it thoroughly in a saturated luke-warm solution of alum, employed also at the rate of four ounces to each pound of linen or cotton; after having previously neutralized the excess of its acidity, by adding to the solution one ounce of soda for every pound of alum: this being done, and the linen or cotton moderately and equally wrung or pressed, it is to be well dried, and afterwards alumed a second time, dissolving for that purpose half as much alum as for the first aluming, and adding to it the residue of the former solution. After this second aluming, the linen or cotton is to be again well dried, and then rinsed, to remove any superfluous part of the alum which may not have been united thereto. By substituting the acetate of alumine (formerly described) for the solution of alum, just mentioned, a more beneficial effect might be obtained; but it would be attended with a considerable increase of expense.

"The use of galls, in this operation, will be readily conceived, by recurring to what I have mentioned, at p. 356 and 357 of my first volume, concerning the effect of myrobalans, when employed by the Hindoos, in causing a more copious precipitation, and a more intimate union of the earth of alum, in or with the calico which had previously imbibed their astringent matter. That this is the only use of galls so employed, I presume, because I have found, by repeated trials, that when employed with madder in the dyeing operation, they add nothing to the durability of the colour.

"For every other purpose, except that of decomposing the alum, and increasing the precipitation of alumine, and, perhaps, its closer union with the fibres of cotton, galls appear to do harm rather than good with madder, by diminishing the vivacity of its colour, and giving it a brownish tinge, without the smallest increase of its durability; on the contrary, I have observed, that when calico printed with acetate of alumine was divided, and one half dyed with madder only, and the other with madder and galls, the colour of the latter, besides a considerable degradation, was injured by being boiled with soap and also by being exposed to the weather sooner, and in a degree considerably greater, than the half which had been dyed with madder only."

Napier[46] points out that "alum forms but a weak mordant for cotton goods, owing, probably, to the strong attraction which the sulphuric acid has for the alumina; there are three proportions of acid to every two of alumina. But if we neutralise a portion of the acid, so that no more remains than is necessary to hold the alumina in solution, which, according to experiment is not above a third of the acid contained in the common alum, its properties as a mordant are greatly improved. This may

be done by taking a quantity of carbonate of soda in solution, and adding this gradually to the alum solution, stirring all the time: the alumina is at first precipitated but by keeping up the agitation, the precipitate again dissolves: continue until all the precipitate is redissolved. In this state alum is a more powerful mordant for cotton, as the base is held more feebly by the sulphuric acid and is readily detached by the superior affinity of the cloth to form a mordant; and thus prepared, it is prefectly pure —any iron formerly present is precipitated in the process. Alum in this state is known by the name of cubical or basic alum, from the form in which it crystallises. We have already referred to Roman alum being superior to other alums."

Very recently Tingle[47] has claimed that alumina is not adsorbed by cellulose either from aluminum sulphate or basic aluminum sulphate solution. The first statement is not new and the second is probably not correct as a general one though it may be true for the particular experimental conditions. There is nothing to show that Tingle appreciated the necessity of having peptized alumina in his solution or that he did have it.

Aluminum acetate is usually used for mordanting cotton both in dyeing and printing.[48] "The most common, and we believe the best method of using alumina as a mordant for cotton, is by substituting acetic acid for sulphuric acid in combination with it. The acetate of alumina has several advantages over the sulphate: 1st, the acetic acid is not so hurtful in its action upon the vegetable colouring matters; 2nd, it holds the alumina with much less force than sulphuric acid, and consequently yields it much more freely to the cloth; and 3rd, being volatile, a great portion of the acid flies off during the process of drying. When strong colours are wanted, and the mordant is of such a nature as will admit of being dried, it is better to dry the cloth from the mordant previous to dyeing. This last property of acetic acid is, therefore, very convenient, as it frees the cloth from any superfluous acid which may have been in the mordant, besides, it has been found that during the drying by heat, the soluble acetate is converted into a less soluble subacetate. We may here put the dyer in mind that when goods containing volatile acids are drying, no other kind of goods should be allowed to be in the same apartment, as the acid will be absorbed by them, and will affect almost any colour that either has been or may be put upon them. Many unpleasant and also expensive consequences occur from the neglect of these precautions."

Bancroft[49] gives an interesting account of the early use of aluminum acetate in calico printing. "By thus substituting the acetic for the sulphuric acid, in the aluminous mordant lately described, several considerable advantages are gained. The acetate of alumine being much more soluble in water than common alum, the liquor will contain a much larger proportion of alumine, than could be otherwise suspended in it; and with this advantage, moreover, that it will not be liable to form crystals in or upon the linens or cottons in drying, as would happen with a solution of common alum, the acetate of alumine being incapable of crystallization. I may add also, that the acid of vinegar being volatile, and having a much weaker attraction for its earthy basis than the sulphuric acid has, the former will be speedily separated and carried off, especially by the heat of the stoves employed for drying the pieces printed with it, and will leave behind the alumine which it has dissolved, and which, being no longer encumbered by any other attraction, will yield itself wholly to that, which subsists between it, and the fibres of linen or cotton, and will unite with them more copiously and firmly than it otherwise could do, and be thereby enabled more strongly to attract and fix the colouring matters in the dyeing vessel. This, however, will only prove true, so far as the sulphate of alumine has been really decomposed by the acetate of lead, or so far as the alumine has been combined with the acetic instead of the sulphuric acid.

"As the practice of calico-printing has been but lately introduced into Europe, and as the acetic aluminous mordant does not appear to have been previously known in any other country, we might have expected that its discovery in this, would have been deemed a matter so important, as to have constituted an area in the history of the art; and, therefore, I was not a little surprised in finding that no writer had mentioned, and that no calico-printer, of whom I have inquired, could inform me, at what time, or by whom, this mordant was first employed, as the basis of red and yellow colours in calico-printing. My wonder has, however, ceased on this subject, since I have inspected a considerable number of recipes for making the several mixtures employed as mordants, soon after the business of calico-printing began to be carried on with some degree of success here, and in other parts of Europe. In one of these which seems to have been the earliest, alum, sal ammoniac, saltpetre, red orpiment, and kelp, were directed to be mixed with water. In another, which probably followed this, it was directed that these ingredients should be dissolved in vinegar. In a succeeding recipe, a little sugar of lead was directed to be employed, but in a quantity too small to be of any considerable use; I mean one ounce of it for every pound of alum. Afterwards, the calico-printers, without any system or reasonable motive, appear in different instances to have added verdigrise, arsenic, corrosive sublimate, blue vitriol, litharge, and white lead. By stumbling upon the two last (which alone were of any use), it happened, where vinegar had been also employed, as it commonly was in some shape, that after a variety of decompositions and recompositions, some portion of acetate of alumine was formed, the good effects of which were experienced, though without any true knowledge of the ways and means by which they have been produced. By degrees, however, the printers seem to have increased the quantity of sugar of lead, and several of them to have suspected that many of the other ingredients usually employed for making their mordants were useless. Some of them, therefore, began to omit one, and some another of

these ingredients, until at length all the useless ones were laid aside, though without the aid of any chemical reasoning on the subject, and without any one having ever suspected, as indeed few of them do at this day, that the lead which they continued to employ, occasioned any decomposition of the alum, or that the mordant so produced did not really contain all the lead and other ingredients used to prepare it. Among the useless ingredients before mentioned, corrosive sublimate seems to have been retained the longest, since Mr. Wilson includes it in his recipe, which was published so lately as the year 1786.

"It is not wonderful, therefore, that no particular person or period has been noted, or remembered, as distinguishable for the first invention of the acetated aluminous mordant; since the sugar of lead, or other means of forming it, were at first used by chance so sparingly, as to have scarcely produced any better effect than would have resulted from the mere solution of alum, and the alterations and improvements by which the mordant afterwards acquired its present form, I had almost said perfection, were made by such impreceptible gradations, and resulted so much from the random additions and omissions of different individuals (no one of whom seems to have been guided by anything approaching to a just theory), that neither the discovery nor any considerable step towards it, can properly be referred to any person or period.

"Mr. Henry, justly sensible of the superior advantages of the acetated aluminous mordant in calico-printing, and conceiving it to have really been very anciently known and employed in those countries where the art was first practiced, concludes from thence, that it must have resulted from a very advanced state of chemical knowledge in those countries, at some very remote period, which was afterwards lost, whilst the improvements arising from it in this respect continued to be practiced and handed down, through a long succession of ages to the present time. To have invented (says he) the process of printing, in the manner described by Pliny, the inhabitants of India must probably have known how to prepare alum; they must have been acquainted with the manner of dissolving lead in the vegetable acids; they must at least have been acquainted with the component parts of these salts, and they must have had a knowledge of double elective attractions, etc. In truth, however, the inhabitants of India neither had, nor have they at present, any knowledge of the use of sugar of lead, or of any other preparation of that metal which could produce similar effects in calico-printing; a solution of common alum in water being their only aluminous mordant, and the previous application of the soluble parts of myrobalans and of buffaloes' milk, to their calicoes, aided by a very hot sunshine, and the complete desiccation which it produces, enabling them, without anything like an acetate of alumine, to give equal durability to their colours. This fact I have learned, not only from all the accounts published, or transmitted to Europe respecting this point, but from the positive verbal informations of eye-witnesses to the practice of calico-printing in that part of the world, and particularly of a gentleman of great veracity, as well as knowledge on this subject, who formerly carried on the business of calico-printing very extensively in Bengal (principally for account of the East-India Company): and indeed sugar of lead is so far from being used for this purpose there, that within a few weeks I have received a letter from Mr. John Adie (successor to the gentleman last mentioned) dated, 'Gondelpara, near Chandernagore, the 10th of February, 1792,' and mentioning, that he had some little time before been obliged to pay twenty shillings the pound for sugar of lead, in order to prepare a particular colour which I had formerly recommended; so far was this ingredient from being in use there for any such purpose.

"We may, therefore, safely conclude, that the formation of an acetate of alumine, and its application as a mordant in calico-printing, was not an oriental discovery; and that it did not result from any knowledge of double elective attractions, or any other extensive chemical knowledge, either in ancient or modern times; since those who gradually stumbled upon and introduced the use of it, were totally ignorant of the decompositions and recompositions which took place in their mixtures, and always supposed, as all other calico-printers have till lately done, and as most of them do now, that the aluminous mordant really consisted of everything used in producing it."

We know that textiles are often made shower-proof by coating the fibers with some water-repellent hydrocarbon, wax or salt,[50] the aluminum salts being often used. We also know that the probability of electrostatic charges is greater the dryer the material we are studying. Both these facts were known empirically to Napier.[51] "Piece [of cloth] mordanted with acetate of alumina and dried at a great heat, are highly charged with electricity. If the hand be suddenly drawn along the piece, a complete shower of fire is observed, with a sharp cracking noise, at the same time a prickling sensation is felt. Whether this has any effect upon the mordant, in its immediately combining with other substances we do not know but cloth in this state is very difficult to moisten—water runs off it as off a duck's wing; but we offer no explanation."

Liechti and Suida[52] have made some experiments on the amount of alumina fixed by cotton from various solutions: but it is rather hard to tell from the abstract exactly what they did. "A weighed quantity of cotton was evenly impregnated with say, an alum mordant until its weight was exactly doubled and then hung in a dry place on glass rods for thirty-six hours. A certain portion was then incinerated in order to determine the amount of alumina which the fibre had at its command. Another portion of the prepared fibre was then dried in a constant air current for six hours at a temperature of 40° C. The fibre was then washed for six hours with a definite amount of distilled water, and the amount of alumina in it was carefully estimated.

From the number obtained it was possible to determine the percentage of alumina which had become fixed on the fibre." This sounds perfectly simple, but the catch is in the phrase "evenly impregnated." The cotton was apparently steeped in the bath and then dried with the mother liquor in it. Since all the solutions had the same amount of alumina in them, an amount equivalent to 200 g $Al_2(SO_4)_3.18\ H_2O$ per litre, one would have supposed that the amount of alumina presented to the fiber would be approximately the same in each case. Actually it varies in a ratio of more than four to one. The data are given in Table II. In the first column is the hypothetical formula of the aluminum salt in solution. In the second column is the amount of alumina in grams presented to the fibers, an absolutely mysterious item. There is nothing to show to what weight of cotton it refers. In the third column is given the amount of alumina in grams fixed by the cotton and in the fourth the percentage fixed. The apparent accuracy is of course absolutely fictitious.

TABLE II

Adsorption of Alumina by Cotton

Formula	Al_2O_3 presented to the fiber	Al_2O_3 fixed by the fiber	Percentage Al_2O_3 fixed
$Al_2(SO_4)_3$	0.6971	0.0901	12.92
$Al_2(SO_4)_2(OH)_2$	0.4473	0.2283	51.04
$Al_4(SO_4)_3(OH)_6$	0.1527	0.0897	58.72
$Al_2(SO_4)(CH_3CO_2)_4$	0.5750	0.5190	90.26
$Al_2(SO_4)(CH_3CO_2)_3(OH)$.	0.5012	0.5012	98.90
$Al_2(SO_4)(CH_3CO_2)_2(OH)_2$	0.1851	0.1851	91.19
$Al_2(SO_4)(CH_3CO_2)(OH)_3$	0.1987	0.1987	96.33
$Al_2(CH_3CO_2)_6$	0.2631	0.2631	51.27
$Al_2(CH_3CO_2)_4(OH)_2$	0.2213	0.2213	99.46

From these data it is not permissible to draw the conclusion, which Liechti and Suida draw, that with aluminum sulphate the percentage of alumina fixed is greater the more basic the mordant. The percentage fixed varies with increasing basicity from 13 through 51 to 59; which is all that Liechti and Suida are considering. From what we know of adsorption, however, it is safe to say that the percentage adsorption would have been much greater than 51 if 0.15 g Al_2O_3 had been presented to the cotton instead of 0.45 g. The percentage adsorption for the hypothetical $Al_4(SO_4)_3(OH)_6$ would have been less than 58 if 0.45 g Al_2O_3 had been presented to the fibre instead of 0.15 g. It is quite possible, therefore, that under comparable conditions the percentage of alumina fixed by the fiber would have passed through a maximum with increasing basicity just as it appears to do with the so-called sulpho-acetates. On the other hand we do not know whether such a maximum, if found, would be real or would be due to the increased amount of sodium sulphate in the solution. In other words, although these experiments were made carefully, they are utterly worthless except as showing the errors which the next experimenter must avoid. Considering the time at which they were made, it is not surprising that the experiments are no better; but it is surprising that for nearly forty years they should have been considered as good work.

Kutschera and Utz[53] made some similar experiments except that they hung the cloth, after drying, in the moist air at about 34° for forty-eight hours. They got a much more uniform mordanting of the cotton than Liechti and Suida did. One square decimeter of their cloth averaged seven grams in weight, and it seems probable, though not explicitly so stated, that this is the amount of cloth to which the figures in Table III refer.

TABLE III

Adsorption of Alumina by Cotton

100 cm² of cotton averaged 7 grams

Formula	Al_2O_3 presented to the fiber	Al_2O_3 fixed by the fiber	Percentage Al_2O_3 fixed
$Al_2(SO_4)_3\ 18H_2O$	0.1566	0.0186	11.88
$Al_2(SO_4)_2(CH_3CO_2)_2$	0.1456	0.1462	100.43
$Al_2(SO_4)(CH_3CO_2)_4$	0.1660	0.1324	79.76
$Al_2(CH_3CO_2)_6$	0.1446	0.1479	102.29
$Al_2(SO_4)_2(OH)_2$	0.1350	0.0688	51.79
$Al_2(SO_4)(CH_3CO_2)_3(OH)$.	0.1495	0.1304	87.19

They confirm Liechti and Suida on the aluminum sulphate, and the basic aluminum sulphate. They are low (80 to 99) on the $Al_2(SO_4)(CH_3CO_2)_4$ and also (87 to 99) on $Al_2(SO_4)(CH_3CO_2)_3OH$. The great apparent difference is with aluminum acetate where Kutschera and Utz get all the alumina fixed, while Liechti and Suida get only 51 percent fixed. The difference may not be a real one because Liechti and Suida get more alumina fixed by weight than do Kutschera and Utz; but they present to the fiber 263 mg as against 145 mg. It is quite possible that all the loss in efficiency comes in at the higher concentrations. This argument cannot be used to cover the cases of $Al_2(SO_4)(CH_3CO_2)_4$ and $Al_2(SO_4)(CH_3CO_2)_5(OH)$ because in both these experiments Liechti and Suida were getting higher percentages of alumina fixed with higher absolute amounts of alumina presented to the fiber.

Sodium aluminate is not used as a mordant in dyeing cotton; but it is padded on for calico printing.[54] There is no direct mordanting and it is necessary to add ammonium chloride in order to precipitate the alumina. The use of aluminum formate[55] and of aluminum lactate[56] has been advocated. Whether one uses an acetate, formate, or lactate does not affect the general theory of the process.

Matthews,[57] who usually follows Ganswindt implicitly, breaks away from him on the question of mordanting cotton and comes out fairly boldly for the formation of a metallo-organic compound. "In mordanting cotton the case is somewhat different, for the metals employed as mordants are usually in the form of basic salts, and the solutions of these, by great dilution, by long exposure to the air, or by warming, may

become dissociated and there may be precipitated either the hydroxide of the metal or a strongly basic salt; for example, in mordanting cotton with acetate of aluminum a hydrate or basic acetate is formed. This, however, cannot be considered as 'precipitation' in the chemical sense of the term. Although it may be shown that when cotton is steeped in a readily dissociated solution of aluminum acetate, a portion of the aluminum is withdrawn from the bath, it cannot be shown however, that aluminum hydrate as such has been precipitated in the fibre. If such were the case, washing with lukewarm acetic or hydrochloric acid would remove all the hydroxide from the fibre again; but this does not happen, which is an indication that the aluminum must be fixed in some other form. A properly mordanted fibre requires that the metallic compound with which the fibre is mordanted must be held by this in such a form and with sufficient energy that the mordant cannot be removed by water or even by dilute acids or alkalies."

After two paragraphs on the mordanting of wool with copper, aluminum, chromium and iron, Matthews concludes that "all these facts appear to show that in mordanting with metallic salts the metal is combined with the fibre in the form of a metallo-organic compound, and the fibre, thus chemically changed, then possesses the proper affinity for dyeing with the mordant dyes." The fallacy lies in the assumption that an adsorbed substance will necessarily have the same properties as the same substance in mass. If that were really the case charcoal could not take soluble substances out of solution practically completely and yet we know it does. If cotton takes alumina out of aluminum acetate, there is no reason why dilute acetic acid should take any appreciable amount of alumina out of cotton and still less out of wool which holds the alumina much more strongly.

Ganswindt[58] believes in distinguishing sharply between the mordanting of wool and of cotton. "The mordanting of cotton is quite different from the mordanting of wool and silk; it has also quite a different intention and significance. The cause of the difference is the inactivity or indifference of cotton towards solutions of salts of the metals. While silk and wool take up the metals in any form on heating, often quantitatively, and fix them chemically, that is not the case with cotton. Cotton has no affinity for metal salts and no tendency to form metallo-organic compounds; even boiling for hours has no effect. It is therefore necessary to have recourse to solutions of strongly basic salts, solutions which are so labile that a mere diluting with water, gentle heating, or just the presence of a textile fiber will cause the solution to dissociate into a normal solution and into a precipitate which latter, at the moment of precipitation, is taken up on or in the fiber. It is not necessary to decide whether the hydroxide is taken up or a more basic salt than that in the original solution, for that point has no bearing on what is to follow. It is a fact, however, that no chemical compound is formed and that the cotton fiber is not changed chemically in any way by the mordanting or, more properly speaking, by the steeping in the salt solutiou. Strictly speaking the cotton is not mordanted at all. When cotton is mordanted, the phenomenon is different from that with wool and silk, in that actually the metal hydroxide or possibly a very strong basic salt, is precipitated mechanically on the cotton fiber and can be removed to some extent by vigorous rinsing. The hydroxide that is left is also held mechanically but in the intercellular spaces.

"The mordanting with tannin and tartar emetic must also be considered as a mechanical process, for there is only a very slight affinity between tannin and cellulose. If one mordants cotton with tannin, it is possible to wash the tannin out quantitatively by repeated treatments with hot water. That is why it is necessary to fix tannin with tartar emetic. Cotton mordanted with tannin and tartar emetic is nothing more than cotton impregnated mechanically with antimony tannate. It is exactly similar when cotton is mordanted with Turkey red oil and aluminum acetate. In all cases the cotton itself remains entirely unchanged. It is not altered or affected chemically in any way and therefore one really ought not to call the process mordanting at all. The only case where there is actually a chemical change in cotton by the action of reagents is curiously enough not called mordanting but—mercerization.

"From all this it is clear that the mordanting of cotton is not at all the same thing as the mordanting of wool. The mordanting of wool is pre-eminently a chemical process, while the mordanting of cotton is a mechanical impregnation of insoluble metallic compounds in the cell spaces and pores of the cotton fibre. For this reason the mordanting of cotton with metallic salts is nothing like as important or interesting as the mordanting of wool. The organic mordants, tannin and oil, are much more important."

This is quite an unreasonable attitude to take. The difference between wool and cotton is purely one of degree, so far as we now know. Wool adsorbs alumina more strongly than cotton does, and is therefore able to take up alumina from less basic solutions than cotton can. Since it adsorbs alumina more strongly than cotton does, it also holds it more firmly, thus makes a fixing of the mordant unnecessary. That point will be discussed in detail in a later paper. There is no satisfactory experimental evidence as yet of the formation of any definite chemical compound between alumina and either wool or cotton. Specific adsorption will account satisfactorily for all the phenomena which have been observed as yet.

It is interesting to note that the one case where Ganswindt is willing to admit a chemical change and a consequent mordanting is that of mercerized cotton; and Leighton[59] has since shown that all the earlier

work on the theory of the process was wrong and that there is no definite chemical compound formed when cotton is mercerized. It is true, of course, that mercerized cotton does adsorb basic and substantive dyes more strongly than ordinary cotton does[60] and it is apparently true that mercerized cotton takes up basic mordants[61] rather more completely from concentrated solutions than ordinary cotton does; but there is no reason to suppose that this is anything more than an increased adsorption due to a change in structure.

The general results of this paper are:

1. All aluminum salts hydrolyze more or less in aqueous solution and the amount of the hydrolysis increases with rising temperature.

2. The actual hydrolysis is greater with weaker acids; but the apparent hydrolysis may be abnormally large in sulphate solutions owing to the coagulating effect of the sulphate ions on the colloidal alumina.

3. The different fibers adsorb alumina to different degrees, wool having a much greater adsorbing power than cotton, and silk being probably slightly inferior to wool.

4. Owing to this difference in specific adsorption, wool decomposes aluminum salt solutions which are distinctly acid while cotton is effective only in more basic solutions.

5. What is taken up and held firmly is the colloidal alumina. While coagulated alumina may be adsorbed to some extent, it rubs off easily.

6. It is probable that in all cases alumina is adsorbed and not a basic salt. The phenomena may be complicated by the fact that the alumina itself will adsorb some sulphuric acid, for instance, and that the wool may, and probably does, adsorb some sulphuric acid also.

7. Since alumina is adsorbed less strongly by cotton than by wool, it is also held less strongly by cotton than by wool.

8. If we add to cotton some substance like tannin which adsorbs alumina strongly, the cotton mordanted with tannin will be able to take alumina out of aluminum salt solutions which are not decomposed by cotton alone. A corollary from this is that alumina will be held more strongly by cotton mordanted with tannin than by cotton alone.

9. The increase in adsorbing power shown by mermerized cotton is undoubtedly due to structural difference in the cotton fibre; but we are not yet able to predict this change.

10. There is no evidence of the formation of any definite chemical compound between alumina and either wool, silk, or cotton.

(Part III will follow in an early issue.)

References Cited in "Mordants"—II

[21] Knecht, Rawson and Loewenthal: "A Manual of Dyeing," 58 (1910).

[22] Bull. Soc. chim. Paris, [2] 37, 197 (1882); Comptes rendus, 99, 37 (1884)

[23] Jour. Phys. Chem., 18, 629 (1914).

[24] Ibid., 23, 283 (1917).

[25] Chem. Centralbl., 1874, 696; Cf. Liechti and Hummel: Jour. Soc. Chem. Ind., 13, 226.

[26] Jour. Soc. Chem. Ind., 14, 653 (1895).

[27] Jour. Chem. Soc., 26, 206 (1873).

[28] "The Chemistry and Physics of Dyeing," 62 (1906).

[29] Jour. Soc. Chem. Ind., 13, 226 (1894).

[30] Cf. Knecht, Rawson and Loewenthal: "A Manual of Dyeing," 237 (1910).

[31] Jour. Soc. Chem. Ind., 5, 526 (1886).

[32] Bancroft: "Philosophy of Permanent Colours," 1, 384 (1813).

[33] Mitt. techn. Gewerbe-Museums in Wien, Sektion für Färberei, 3, 48 (1886); Jour. Soc. Chem. Ind., 4, 526 (1886); Knecht, Rawson and Loewenthal: "A Manual of Dyeing," 237 (1910).

[34] Knecht, Rawson and Loewenthal: "A Manual of Dyeing," 238 (1910).

[35] Knecht, Rawson and Loewenthal: "A Manual of Dyeing," 237 (1910).

[36] "Application of Dyestuffs," 602 (1920).

[37] "Application of Dyestuffs," 588 (1920).

[38] Knecht, Rawson and Loewenthal: "A Manual of Dyeing," 15 (1910).

[39] Knecht, Rawson and Loewenthal: "A Manual of Dyeing," 238 (1910).

[40] Both are used according to Ganswindt: "Theorie und Praxis der modernen Färberei," II, 18 (1903).

[41] Chem. Centralblatt, 1905, I, 128.

[42] Ibid., 1904, II, 674.

[43] [He is referring to Bodländer and Abegg's theory of electro-affinity.]

[44] Bancroft: "Philosophy of Permanent Colours," 2, 148 (1813).

[45] "Philosophy of Permanent Colours," 1, 357; 2, 242 (1813).

[46] "A Manual of Dyeing," 120 (1975).

[47] Jour. Ind. Eng. Chem., 14, 198 (1922).

[48] Napier: "A Manual of Dyeing," 121 (1875).

[49] "Philosophy of Permanent Colours," 1, 365 (1813).

[50] Weber: Jour. Soc. Dyers and Colourists, 17, 146 (1901).

[51] "A Manual of Dyeing," 125 (1875).

[52] Jour. Soc. Chem. Ind., 2, 538 (1883).

[53] Mitt. techn. Gewerbe-Museums in Wien, Sektion für Färberei, 3, 110 (1886).

[58] "Theorie und Praxis der modernen Färberei," II, 214 (1903). II, 224 (1903).

[55] Schwalbe: Zeit. Kolloidchemie, 5, 129 (1907).

[56] Boehringer and Sons: Zeit. Farben-Ind., 9, 237, 253 (1910).

[57] "Application of Dyestuffs," 602 (1920).

[58] "Theorie und Praxis der modernen Färberei," II, 214 (1903).

[59] Jour. Phys. Chem., 20, 188 (1916).

[60] Matthews: "Application of Dyestuffs," 165, 278 (1920).

[61] Schaposchnikoü and Minajeff: Zeit. Farben-Ind., 3, 165 (1904); 4, 81 (1905).

COLORED RESISTS UNDER STEAM ANILINE BLACK BY MEANS OF TUNGSTATE LAKES

By C. Sunder

Resists under prussiate black are frequently soiled by a kind of sublimation which occurs in steaming, and Albert Scheurer got over the difficulty by the use of tungstate. Later on oxide of zinc was used for the purpose, tungstates being too expensive. For colored resists, basic colors which were not affected by sulphite were in vogue for a time, but their concentration was generally too weak.

For colored resists the author prefers tungstate lakes of basic colors to those prepared from tannic acid, the former being obtained in a very much more concentrated condition.

Yellow Lake

100 pints Auramine.
300 pints acetic acid 50 per cent.
17,000 pints water.

Dissolve, strain and add 1,500 pints tungstate of soda sol. 20 per cent. The precipitate is made up to 300 pints.

Violet Lake

100 pints Crystal Violet.
1,000 pints water.
100 pints acetic acid 50 per cent.

Dissolve, strain and ad—
220 pints tungstate of soda (tech. pure).
800 pints boiling water.

Cool and add add—
200 pints acetic acid.

Filter and make up to 800 pints.

For lighter shades the lake is thrown down on oxide of zinc. The lake thus obtained is brighter than the one obtained by mixing the tungstate lake with oxide of zinc.—Bull. Soc. Ind. Mulhouse, through J. Soc. Dyers and Colorists.

Fine Wool Mixture Cloths

Cut Stripes and Velours—Velours with Cotton Warps—Responsibility for Velour Deficiencies—Mixture Naps—Variations in Strength—Treatment of Stubborn Cloth

By "AN OLD CLOTH RAISER"

THERE is quite a new feature in mixture cloths. Most of these are wool dyed, and therefore when raised there is no need for them to go through the process of piece dyeing. One of the qualities is very fine and soft and is being worked up in various ways as required for finishing purposes.

The particular finish required for this class of material is naps, cut stripe and velour. Each, of course, needs to be put through the raising process. In comparison with the heavier qualities, such as heavy woolen and cotton fabrics, they require careful treatment in this process, otherwise a large amount of damaged material will result.

To raise this type of material with teazles which are proud or overkeen would seriously affect the strength. Nothing to my knowledge of such an excellent quality has been previously introduced where there has been the same danger of over-raising, and this is of vast importance to anyone controlling a raising department, because, where the cloth becomes impoverished from this source, it results in a great loss, the material being composed as it is of pure wool. The chief concern of the raiser is to confine this quality entirely to the breaking in gig where teazles have been well run down, and to treat with as few turns as possible.

The less the wool is disturbed by traversing the better, as through such disturbance the cloth becomes weaker and the warp will be in grave danger of becoming exposed upon the surface. Thus it will be seen that extreme caution is required in the raising process.

Carefully handled these cloths have a most excellent finish. It is necessary to clean flocks from the cylinder in half sets, and to work in the breast roller down automatically. Too much cylinder pressure is harmful. The same methods as regards raising may be adopted in all the three qualities mentioned above. The difference involved is in the finishing department. Where the cloth is required for nap, it is hydro-extracted after raising. Then it goes to the striking gig and is put on the contrary end up. This method has a tendency to raise the pile, which gives the cloth a more lofty appearance. It is only necessary to give the piece a few rounds in this process, running until the wool becomes straightened.

It is then taken to the piling machine where the wool is raised by means of a card roller. Tentering or drying forms the next process, and the wool is further raised by batting up sticks, which are constantly brought into direct contact with the piece as it runs through the tentering machine. Piling, cutting and napping follow, and the piece is then ready for the warehouse.

Cut Stripes and Velours

The cut stripe pattern has come very much to the front within the past few years, and as the design is both neat and attractive there is no reason to doubt it having come to stay. When raised and buzzed it is kept straight during the striking. This gives it the appearance of a cloth with a straight finish. It then goes through the piling and tentering operation without, however, being batted up. The piece then receives its form of cut stripe during the cutting process, the cylinders being set out for that purpose. The cloth then resembles in appearance the corduroy pattern.

The velour cloth goes exactly through the same process until it reaches the finishing department, where by piling and cutting and keeping the wool more in an upright position, it is possible to keep the wool from lying either one way or the other. Velours, through their fine attractive appearance have become popular, and with the large amount of cloth of this type which has been manufactured there seems every likelihood of another boom in this particular trade.

Velours with Cotton Warps

Velours are made in a variety of qualities, often in most gorgeous colorings and in many different styles, being composed in the main of cotton warps, which makes them stronger and more durable than velours composed entirely of wool.

When these are raised in the white, being piece dyed cloths, they are buzzed, tentered, cut and dry beaten in the gray before dyeing. The dry beating is done in a gig into which the cloth goes in the dried state, and is put on the reverse end from that which is customary in the raising process. The fibers of the cloth are reversed at this stage and steam is introduced to give the cloth a softer handle. In the dry-beating process teazles that are well run down should be used. It is necessary to run the piece on this machine from twenty minutes to half an hour. When this is accomplished the piece is ready for dyeing. Striking head end then follows, then piling, tentering, cutting a second time, brushing and steaming complete the whole process.

There are several qualities in this particular type of material, varying considerably in strength and structure, and experience in adjusting the machinery to meet the needs of various strengths is required.

Velour Deficiencies

As velours become very solid and closely knit together when milled, cockled, rigged and streaky places occur when they are put on the gig. Each of these is a difficult problem in itself in view of the amount of raising the cloth requires; it is brought into direct contact with sharp pointed teazles, and this leads to the probability of damage to these portions. In order to minimize this danger it is usual to have the pieces steamed and rolled and pulled out straight list to list. They are then allowed to stay on the roller over night so that they become thoroughly set and cooled.

Even after this has been done and water has been applied to the surface for raising purposes, there is still the possibility of shrinkage. Many of these deficient places resume their former condition, which entails a tremendous amount of responsibility for the raiser, as he is in constant fear of some of these places being cut through. In many cases wood slats with pins inserted at each end are placed on the back of the piece to hold out or straighten the cockled part.

Who Is Responsible?

For two years or more this trouble has been a very serious one. With some firms the difficulty is to trace it to its source. Many suggestions have been offered; drastic alterations have been made in regard to weaving, etc.; spinning departments have often been overhauled; changing the number of shuttles in the loom has been tried, but although vast improvements have been made there still remains much spade work by the authorities and practical men concerned before a satisfactory solution can be secured.

Rigged places very often arise as a consequence of the cockled and uneven places in the cloth. To all appearances cockled places are a result of uneven weft, which shows itself very forcibly after the cloth has gone through the milling process. This is noticeable even by any novice, as the variation in width of the affected part is quite pronounced.

The cloth miller, of course, is not responsible. His work seems inefficient simply as a result of neglect or lack of knowledge in some preceding department of which no one is desirous of shouldering the responsibility. Here is the need for co-operation by all concerned to try as far as possible to remove one of the worst forms of evil that textile industry has had to contend with for years. This is all the more important in view of the great demand for this type of material.

Other Faults

Where white velour is manufactured by a firm engaged with various types of material there is often a danger of dirty marks—stains and grease which pass from one department to another. It is not always possible to keep machines fully occupied with one quality of cloth. The result is that dirt and other matters become partly fixed. When a white velour picks up the slightest stain from a colored or even ordinary gray piece, it is most difficult to dislodge.

These are difficulties which place the dyer at a great disadvantage. In cases where pieces are required for bright colors marks or stains often show. This results in many cases in the piece having to be redyed. In addition to the cost of redyeing the material, which of late has meant a heavy expense, there arises the discomfort of the dyer beign repeatedly called upon to do his work over again. Though it is not always possible to eliminate all these deficiencies, we can by care and protective measures minimize them to a considerable extent.

Mixture Naps

During the past eighteen months designers have been very active in bringing out designs in mixture naps. These, too, are wool dyed, which reduces the usual amount of piece dyeing. In many cases these new cloths are something on the lines of the woolen warp velours,

that is, for raising purposes, which creates almost a new idea from a raising standpoint. These pieces should be treated with the utmost care, although in most cases they handle fairly bulky. The fibers of the cloth being somewhat loose in character they get up fairly lofty, even though the treatment is very light.

Quite a number of these have a large check on the back, which will be used, when made up, as a lining. These backs are made up in many varied colors, which adds a charm to the material. Contrary to most pieces of the mixture nap quality they require a nice soft handling touch on the back, consequently demanding quite a reasonable amount of work on the gig.

Variations in Strength

It is often found in raising that cloth at different times varies considerably in strength, even though it may be of exactly the same quality of material. A delivery for raising may be at one time quite mellow and subtle in the handle and consequently require lighter treatment, otherwise tendering may occur.

Another important matter is that where fancy colors have been dyed there is often a danger that in raising they may come up uneven in color, flecked or cloudy. This means that the dyeing process has to be repeated often in a much more severe form, as the former color has in many cases to be stripped completely off, which in addition to the reboil has a serious effect upon the strength of the cloth. A third operation may be necessary before perfection in color can be guaranteed. This shows how the strength of the cloth may be seriously affected. Thus it is essential for a raiser always to make sufficient allowance in strength of pieces in order to allow for what is known as cobbling. This applies in particular when cloth comes through the milling in a kind, flexible and subtle condition.

Treatment of Stubborn Cloth

We occasionally find exactly the same type of material very hard-fast in the bottom, showing also a very dull cast which certainly has a most deadening effect upon the face of the cloth. The raiser is confronted here with a difficulty which is often hard to overcome. Teazles have little effect upon such a cloth unless they are of very good quality, as the loose fibers, or those that should be fairly loose, refuse to be drawn out to the surface only under very extreme pressure. In this case over-raising is almost impossible. Extra cost is entailed in regard to keeping in the gigs a much better quality of teazles, and a much larger quantity is used. Even then we have no assurance of securing the beautiful finish required, as the cloth will be devoid of luster and soft handle. The question of output is also largely influenced, particularly in a large department where hundreds of pieces may be affected in one week.

Causes of Deficiencies

In trying to define the real cause of the irregularities quoted above, one finds it rather a delicate subject to treat with, simply because the deficiency arises in preceding departments. One of the chief causes may be attributed to improper scouring. In this case there is no difficulty in arriving at a definite conclusion, owing to the greasy handle of the material.

Water is another direct cause. When it is hard and very harsh there is a difficulty in getting it to penetrate as it should. This prevents proportionate distribution of the water in raising, much of it runs quickly off the piece, and this is very obstructive from a raising standpoint.—"Dyer and Calico Printer."

DYEING CELLULOSE ACETATE SILK

Cellulose acetate in the form of cellulose acetate silk or films cannot be dyed directly by the usual methods for artificial silk, because the power of taking up the dyestuff is completely or essentially lacking.

There are various processes for treating cellulose acetate silk and cellulose acetate films with inorganic or organic compounds before they are dyed, in order to increase the capacity of the fiber for taking up the dye in the dyeing operation. None of these processes has found technical application, because preliminary treatment causes tendering and loss of the cellulose acetates. Furthermore, treatment with alkalies at high temperatures damages the luster of the cellulose acetates under treatment.

Dr. R. Clavel, of Basle, has taken out a patent (176,535) for directly dyeing cellulose acetate silks and cellulose acetate films with acid, basic or direct dyestuffs, with addition of one or more protective colloids such as gelatine or a sericin soap or a boiled-off liquor in presence of acetic acid or formic acid, and in presence of at least one chloride soluble in water like stannous chloride, zinc chloride, magnesium chloride or ammonium chloride. In this manner the cellulose acetates in the form of a band or threads may be dyed at temperatures up to boiling point without depreciation of luster and without the usual losses, woolly effects and tendering, due, for instance, to saponification.

The dye bath may contain chloride of zinc, potassium, sodium, magnesium or barium, or a mixture of them, and protective colloids such as gelatine, albumen, a boiled-off liquor, a tannate, a soap or a sulphonated fatty acid. The dyestuffs which may be used are any basic, acid or direct cotton colors. The dyeing is done preferably in a foam bath, in which case the protective colloids, together with the salt solution, serve at the same time as emulsifiers and foam producers, and by their surface activity in common with the color colloids considerably increase the power of absorption of the cellulose acetate.—Canadian Dyer & Color User.

Scouring and Milling

Scouting Methods—Fancy Worsteds Scour—"Low-Goods" Scour—Use of Solvents—Instruction Furnished by Extreme Cases

By J. SCHOFIELD

A Paper Read Before the South of Scotland Section, Textile Institute, and Published in the Journal of the Institute

IT is possible to classify the various methods of textile scouring in more than one way. On the wool side of the textile industry, piece scouring might be divided, according to the materials worked on as: (1) Scouring of high-grade woolens; (2) scouring of worsteds; (3) scouring of low-grade goods. These differ primarily in respect of the kind and quantity of oiling applied to the fabrics. Thus on the better class woolens there would be heavy oiling of, say, 10 per cent on the weight of the wool, and consisting of good quality wool lubricant containing in general much free fatty acid. Contrasted with these are the good quality worsted cloths carrying light oiling of 2 to 3 per cent, and of a neutral or nearly neutral type. In the low-grade goods the oilings are again heavy and of a worst type, often with large percentages of mineral oil; here, also, there are the special difficulties of these fabrics to be detailed later.

Scouring Methods

1. Solvent scouring, in which oily and fatty matters are extracted from the fiber by the direct solvent action of benzene, petrol, etc.

2. Saponification scouring, in which the free fatty acids of the oils are converted into soaps in the scouring machine by the action of the alkali.

3. Emulsification scouring, in which the greasy dirt is removed mechanically by the formation of a frothy lather or emulsion; the wetting-out power of this lather causes the breaking up and detachment of the oil, etc., from the surface of the wool fiber. This is obviously a physical process as contrasted with the chemical process of scouring by saponification.

These methods are ideal statements of types of scouring to which practical methods conform more or less. Thus, most scouring of raw wool in the usual bowls is of the emulsification type. The scouring of fancy worsters by weak alkali and some soap is a further example of emulsification working.

On the other hand, good woolens carrying oil with large percentages of free fatty acids may be scoured throughout and well scoured—by alkali alone; sufficient soap is formed in the machine to use up the oiling both directly as soap and indirectly as emulsion. This is a typical saponification scour. The scouring of low-grade goods has usually to be of a composite kind, which we shall consider later.

The Saponification Scour

It is most useful to discuss first the saponification scour, as it well illustrates the principles concerned, is scientifically justifiable at all stages, is easy to carry out in practice, and finally, is thoroughly efficient in its results. It is an obvious truism that the oiling for wool lubrication at the spinning end and the subsequent scouring operations must be intimately connected. In the present case of good woolens it is assumed that the spinning oils are the usual "oleins"—*i. e.*, crude oleic acid of high saponifiable quality with some mineral oil, say, 20 per cent—commonly employed in the trade. In this case the wool oils will have large amounts—possibly 40 to 60 per cent, or even more—of free fatty acids; that is, these fatty acids will not be combined, as in the neutral animal and vegetable oils, with glycerine, but are free to enter into chemical union with the soda carbonate to form soap. This is a reaction which is possible at moderate temperatures, and hence the scouring of such goods is quite practical by alkali alone as follows:

Stage 1.—Run in soda ash solution of 5 to 6 deg. Tw. at about 90 deg. Fahr., using, say, 20 gals. per 100 lb. of wool. Let this saponify, running for ten minutes or so, and then without addition of water open the suds box and let the dirty emulsion away to the drain. When the machine is thus emptied—

Stage 2.—Add alkali as before, about five gallons per 100 lb. of wool, scour for twenty minutes or so, and—

Stage 3.—Wash down; warm water at first, and slowly, then stronger and colder.

The principles of this saponification two-stage scour are—

1. Attack by alkali on the free fatty acids of the spinning lubricants with formation of soap.

2. The resulting emulsification detaches the superficial dirt of the fiber, and this is removed at an early stage from the machine.

3. This stripping action is intensely assisted by the generation *in situ* of carbonic acid gas by the action of the fatty acids on the alkali in forming soap—an extremely powerful detergent factor peculiar to saponification as contrasted with purely emulsification scouring.

4. The use of a clean and unexhausted scour, of good diffusibility, for the deeper penetrated dirt of the fiber, which requires longer continued action for its saponification and emulsification. It must be remembered that col-

loids do not diffuse through colloids; soap as soap is not a penetrant of the wool fiber. But a crystalloid substance like soda carbonate possesses high diffusibility and can pass into the actual tissue. The method here described is probably the most efficient of all scours on wool goods in point of cleanliness in the resulting fabric. Seeing that much of the free fatty acid of the wool oil is oleic acid, the resulting soap formed in the machine is a sodium oleate. Such soaps are known to be particularly soluble at comparatively low temperatures, hence their scouring properties are enhanced, and further, their easy removal from the fabric is assured. It is instructive to consider this scour as an ideal to be followed as far as practicable in other cases.

Consider now the scouring of high-class worsteds. Here, the oiling is not only much lessened in quantity but is usually of a more neutral character. Now the saponification of a neutral oil, even when of animal or vegetable origin, cannot be effected by carbonated alkalies at ordinary scouring temperatures. Hence, a straightforward saponification scour is not feasible on these goods, and the usual process is as follows:

Fancy Worsteds Scour

Alkali of 2 to 4 deg. Tw., in accordance with the reduced oiling, together with some soap from the outset, the idea being to work up an emulsion which, by diminished surface tension or increased wetting-out capacity, will detach the oil and dirt and float them away from the fabric.

It would be interesting to know the practical reasons, if any exist, why worsted spinners do not use oils with large fatty acid content, as do their brethren on the woolen side. The addition of small amounts of free fatty acid to mineral oil for machine lubricants has been found to increase their efficiency, diminishing the friction in some cases to one-half that of mineral oil alone. In the textile case, the presence of free fatty acids enormously facilitates the work of the scourer, and it is therefore important to know what are the objections on the worsted side. It is, however, an actual fact that many worsted "oleines" contain moderate percentages of such acids. In these cases it is possible, and often superior in practice, to conduct a worsted scour thus:

1. Run on alkali 2 to 4 deg. Tw., warm, for ten minutes, and then, without any addition of water, lead this off to the drain.

2. Add more alkali—preferably weaker—and some soap, and complete the scour.

3. Wash off, warm and gently at first, colder later.

It must be noted that overstrong alkali solutions prevent the proper solution of the soap; it is far preferable to work with weaker solutions and in more than one stage.

The "Low-Goods" Scour

In this class of trade the unfortunate scourer meets with all his difficulties in their worst forms. There may be excessive bleeding of color due to loose dyeings, poor dyestuffs, dyeing in the grease, etc., low-grade oilings often with much mineral oil, sizings, recovered wools, flock wastage, and the rest. In many cases the conditions to be met are incompatible—*e. g.*, the necessity of scouring at low temperatures to prevent bleeding, thus losing the advantage of the decreased surface tension (*i. e.*, enhanced wetting-out power) of a warm scour.

The surface tensions of water at various temperatures are given in a paper in "Science Abtstracts," October, 1921:

Temperature, ° Cent.	0	18	36	69	89
Surface tension	76.7	75.6	70	64.8	60.9

Thus, taking 36 deg. Cent. or 97 deg. Fahr. as a scouring temperature, there would be a gain of nearly 10 per cent in lowered surface tension as compared with ice-cold water. Perhaps, however, the bleeding of color must be prevented even at the expense of some perfection in the scour.

The low-grade oiling offer in these goods the maximum of difficulty. There is often much mineral oil, which tends to prevent the formation of proper emulsions, and, being itself unsaponifiable, is removable only by a process of emulsification. There is usually an undue proportion of other unsaponifiable matter and a corresponding lack of free fatty acids; a sufficiency of these would in many cases simplify the scouring of the goods, enabling at any rate the first stage of a saponification scour to be effected. Many so-called "black oils" are excellent from the scourer's point of view owing to their high content of free fatty acids; much of the scouring of low-grade goods would be vastly improved by a judicious addition of suitable black oil to the spinning lubricant. It is undoubtedly desirable that wool oils should be specified in terms of free fatty acid, in addition to—or in place of—total saponifiable matter. It is free fatty acid, and not merely neutral saponifiable oil, which is of primary importance at the scouring end.

It is, therefore, not possible at present to lay down the exact lines of a low-goods scouring operation. If oiling can be modified in the direction of securing a proper quantum of free fatty acids, then a two-stage scour of the following type may be practised:

1. Run in warm alkali 5 to 6 deg. Tw. if the colors do not bleed; otherwise, cold. Scour from 10 to 15 minutes, and, without added water, open the suds box and pass this away to the drain.

2. Add further alkali, weakened, together with some soap, to build up an emulsion; scour out.

3. Wash down, preferably with warm water at first, if the dyeings will permit.

There are some special points in the practice of low-goods scouring which merit further discussion.

It is possible that slight additions of caustic soda to the first stage of the scour may be found useful. Caustic as against carbonated alkali will saponify free fatty acid in the cold; it is, further, more active in the softening of possible hardness in the water. But the concentration of such caustic alkali must be small in view of its strong tendering action on the wool fiber; a strength of perhaps not more than two ounces in ten gallons of the scour may be tried. Further experiments are necessary. Ammonia in scouring is invariably used in the form of hydrate and never as carbonated alkali.

Use of Solvents

Another question bearing on the low-grade scour more particularly is the use of the so-called "solvents." There are a number of substances capable of dissolving oil or grease quite freely—*e. g.*, ether, chloroform, carbon bisulphide and tetrachloride, alcohol, benzine, petrol, turpentine, and certain chlorinated hydrocarbons such as trichlorethylene and tetrachlorethane. When the various physical and chemical properties of these bodies are compared, it is seen that only a few—viz., alcohol, carbon, tetrachloride, tetrachlorethane, etc.—are adapted for employment as adjuncts to a textile scour. And it further appears that their true utility is not the dissolving of oil or grease, but their property of lowering the surface tension of the scour. If experiments by the drop pipette or by soap bubbles are conducted with solutions containing these bodies, it will be found that there is a reduction of the surface tension of the scouring liquor beyond that attained by the use of soap. Hence, there is scientific justification for their use under proper conditions, and further experience is necessary to determine which substance, and under what conditions, the highest efficiency is obtained. Other things being equal, the property of perfect miscibility with water possessed by a substance like alcohol is to be desired as against bodies like tetrachlorethane, which require emulsifying agents such as sulphonated oils to assist their dissemination throughout the scouring liquor. The whole question is one requiring further investigation.

Extreme Cases

Some useful notions respecting the principles of scouring and the proper modes of procedure may be gained by considering certain extreme cases not necessarily met with in practice. Suppose fabrics lubricated as follows:

1. Oiled with pure mineral only.
2. Oiled with pure neutral animal or vegetable oil only.
3. Oiled with pure free fatty acids only.
4. Lubricated with dilute glycerine.

Taking the last case first, a simple steeping and working in warm water would cleanse the fabric. The cloth oiled by free fatty acid could be completely scoured by the use of alkali alone. The fabrics having either mineral oil or neutral glycerides would require soapy emulsions, perhaps repeated several times; or, alternatively, extraction by solvents.

There are many other points in scouring theory worthy of close attention. The subject of detergent materials is in itself a wide one, embracing such questions as—

1. The proper strength of alkali solutions; and of soap solutions.
2. The temperature of scouring.
3. The best kinds of soaps for textile work.
4. The function of ammonia in the scour, and its utility.
5. The limits of mineral oil in wool lubrication; the penetration of such oils as compared with oleins, etc., into the fiber tissue.
6. The use of resin, silicate of soda, etc., in soaps.
7. The limits of hardness of water for textile purposes.
8. The consistency of the scour; should a scouring liquor be thick and creamy, or thin and sloppy?

SIZING FOR COLORED BORDERS ON COTTON WARPS

It is usual to mix a special size for use on the colored yarn of dhootie borders and of colored stripe effects, and so forth. It is common to find such size made largely from farina (on account of its whiteness) or from tapioca (because of its transparency), the idea being to dull the colors as little as possible. Paraffin wax is often used as emollient in order to give a polish to the yarn and to minimize rubbing off of the color by the shuttle. The defect of such a size is that it very rapidly boils thin. Unless the number of colored ends is very large, it is absolutely essential that the size be able to withstand prolonged boiling without serious deterioration. It is therefore necessary to use an adhesive such as sago, cornstarch, or "gum tragasol," and so forth. These give strong, permanent pastes which are at the same time sufficiently transparent to have no appreciable effect on the colors. Wheat starch is better avoided, as it tends to give a cloudy effect.

A good size to use is a slight adaptation of the ordinary pure size mixing. It is best made without caustic soda (this, of course, necessitates longer cooking), as the latter has sometimes an effect on the dyes.—Color Trade Journal.

DYE PRODUCTS & CHEMICAL COMPANY ADOPTS "DYELENE" AS BRAND

The Dye Products & Chemical Company, Inc., has registered the trade-mark "Dyelene" with the U. S. Patent Office, and all dyes and intermediates manufactured by this concern will hereafter be marked under this brand.

Worsted Color Matching

Color Matchers Are Born—Comprehensive Scheme in Choosing—Ability of Matchers—Color Matcher and Yarn Salesman Should Share Control of Colors

By SAMUEL KERSHAW

THE color matcher is finding his work still difficult because of the shortage of synthetic dyewares. His services are more valuable on that account. He is always and must be very accommodating to meet demands made by the devotees of fashion; to be equal to the bewildering variety of shades required by designers; to be ahead of his fellow tradesmen by producing some useful, new, and striking range of shades for marls, mixtures and fancies.

Color Matchers Are Born

It has been said of the color matchers, as of artists, that they are born, not made. However, among those who follow this calling are a few who do not possess that intelligent perception and adaptation necessary for the performance of the highest work, and keeping their firm in the front rank of color spinners. Color matchers are men of varying ability though they may have had similar training in shade room and classroom. This work allows cultivated imagination to play a useful part; in fact, under the name of initiative it is said to be their chief asset. Again, it may be proved by the different methods employed by two men in matching a sample. One may take a few hours, making numerous trial blends before hitting upon the right one; while the other by deeper insight and a knowledge of his standards and their strengths may very soon produce a matching.

The color matcher has other work besides matching shades. Probably his most important work is the choosing and arranging of suitable ranges of colors and the keeping down of stock. By carefully noticing the sample orders he obtains an idea of the shades which are going to be required and prepares accordingly; he can keep down stock by making one color take the place of several; by skilled attention to these points he can save his firm much expense in the course of a season. Without this rigid control in the shade room, it will be impossible to keep the colored top warehouse clear. A good color matcher, who can follow out these rules, should be encouraged in a practical manner, and credit given to him for the saving effected.

The color matcher may be working on a matching, and have an idea that a particular color will give him the necessary tone for the matching. But even then he must not use it if the color is an old one, and one which has been discarded previously. If a color has been thrown out it must be out. If, for any reason, it is found necessary to reintroduce a color it must be done properly, and due notice given to the dyer.

Experience and ability, and a thorough study of the matter are necessary before it is possible for a man to decide the colors that he can do without. When selecting colors for a season, care should be taken to ensure no overlapping, and standards should always be kept. Where bright colors selected are few in number, they can be stocked freely, in the certainty that demands will be made upon them. There is a saving in expense, because small lots cost more per pound for dyeing than large lots, and cause more trouble, because small lots are always running out.

Comprehensive Scheme in Choosing

Each season the general range of colors should display a distinct change in tone. This is only possible where each season a small range of colors is worked with. Those who habitually work with long ranges can add only a few new ones; this leaves one unprepared to strike really good new ranges. Firms that are afraid of throwing over old ranges find themselves unable to reduce their stock, and it is doubtful whether this system really pays in the end. If an order is taken for an old range, it is often necessary to remake specially a whole series of mixtures, and this extra trouble and expense incurred, if reckoned up, will prove that old ranges should be taken off. At the same time some method should be devised for continually using up old stock, without recourse to making jobs. The color matcher should produce new ranges of sufficient variety following the demands of fashion, use up old ranges and dispense with them entirely. There are some, however, who carry over a selection of "has beens," probably in fear of the initial cost in making up entirely new ranges, but this first cost is no gauge of the final cost, and should not be considered.

In choosing colors for a new season's ranges, a very comprehensive scheme should be evolved, and in this the skill of the color matcher is tested. As an instance of this kind a practical example is given: Spinner A produces three ranges of khakis, varying from "red" to "green." These are made from entirely different colors. Range 1 contains seven colors; range 2 six colors, and range 3 nine colors; in all twenty-two colors. Spinner B also produces three similar ranges of khakis. The colors required for range 1 is ten; for range 2 seven, and for range 3 eleven.

On the face of it, it appears that Spinner A has the most skillful color matcher, because he produces each range with a smaller number of colors than the other. The latter, however, is the better man, because by using duplicate colors, he produces all three ranges from sixteen colors, compared with twenty-two used by the color matcher of Spinner A. It may be said that consistent with originality, the art consists in producing the greatest variety of ranges with the smallest number of colors.

It is necessary also to mention the importance of standards in this work, without which it would be impossible to keep on working and to meet complaints of off-shade. When a new mixture has passed through the drawing, a small sample is put on one side, and every subsequent run of that mixture must be compared with it. If shades are being passed to the *last* made, it may be discovered, when several runs have gone through, that they have wandered from the original, and some doctoring is necessary before they are passed. This is disconcerting, and damaging to the reputation of the firm. Standards should be kept in the proper place, the quality and shade number being recorded to facilitate finding them when required.

The position of the color room should be on the north side of the building. Direct sunlight and artificial light are not suited to this work. There are two methods of examining matchings, of which the overhand method is preferable to the underhand, because the light rays are then influenced by the color of surrounding objects. For matching in the morning a northwest position should be sought, while the afternoon position should be northeast. In these two positions at the respective times stated the light is most diffused.

There is an idea among the uninitiated that the depth of a shade can easily be changed by the addition of black, white or gray, and that this is the common method of changing the tone of a shade. This is not so. When new colors are introduced a full range of depths of shades should be chosen, so that any and every effect can be readily produced from them. In this the color matcher must have full power of taking all or some, as he thinks fit, of the dyer's range of shades.

The color matcher and the yarn salesman should act in conjunction in controlling the stock of colors. In respect to this the color matcher's method of working should be recognized. Collaboration with the salesman is useful when ordering big weights for future needs, the man in the market should be able to visualize coming fashions. The color matcher has the work of controlling, arranging and choosing of stock, and should not be overworked so as to lose control of it. His work is full of important details, and to neglect this part of the business will probably mean the accumulation of old colors and the running out of colors urgently required.

The color-room staff is also called upon to make matchings for samples, many of which are not taken up. Recent years have seen an increase in this call for samples, which places much labor on the color matcher, labor which often proves abortive.—"Textiles."

GERMAN FLAX AND RESEARCH

(*Concluded from page* 230.)

Courses extend through the year with occasional vacations, and, what is more practical than pious, there are courses for evenings and *Sundays*.

Another feature is accident insurance, furnished at a very moderate price.

Theory and Practice Thoroughly Covered

It is hard to say whether the theoretical or practical side is most emphasized, as both are so thoroughly covered. A quotation on the flax preparation course translated from the prospectus is typical of all: "Anatomy of Flax Plant with Special Reference to the Stem. Theory of Retting. Retting Methods and Their Critical Comparison. Mechanical Flax Preparation. Commercial Flax Grades. Adulteration. Statistics. Technical Properties of the Flax Fiber. Scutched Flax as a Commercial Product. Classification of Flax. Trade Requirements. Calculations. Theory and Description of the Heckling Machine. Properties of Heckled Flax. Classification of Tow. Storing.—With production in a practical way and numerous demonstrations."

The accompanying photograph gives a glimpse of the main building, which is only a small part of the whole establishment.

The buildings were used for war purposes, from which service the school has not entirely recovered. As is to be expected, there is also some difficulty at present in getting funds. If money is to be had, however, there seems to be some way usually in Germany to finance this kind of an enterprise.

Not the least factor in the success of the flax industry is a characteristic list of societies, a number devoted to flax only, and all more or less closely associated with the Sorau district. They include national and local organizations of growers, retters, spinners, weavers and commercial interests.

The important and permanent nature of these can be judged from the snapshot of a new building devoted exclusively to the needs of one association, that of the bast fiber retting and preparing establishments.

Only recently, too, there was held at Sorau an exposition at which was shown a great variety of machines and products connected with this industry; not as elaborate or nearly as large as our own textile shows, but significant of progress.

We have no occasion—nor, in fact, any necessity—for trying to imitate these German methods, for they are not essentially different from our own research and educational work. They do emphasize again, however, the need of fundamental research and more technical knowledge even in the old-established textile industries.

The Practical Examination of Dyestuffs

First Steps in Examination—Mixtures—Presence of Salt—Completing Identification—Importance of Comparison—Value of Various Methods—Examination of Different Classes of Dyestuffs—Classification by Dyeing Properties

By LEON W. SIDEBOTTOM

Essex Aniline Works, Boston, Mass.

THE textile chemist or colorist is the recipient of countless dyestuff samples which may be either competitive products for dyestuffs already in use, or new products which he may readily substitute. The competitive products must be tested against their prototype for money value, while the new products must be identified, if possible, the properties determined, and filed away for any future reference.

Dry Powder or Crystals

When a sample has been received in the laboratory, the first step is, naturally, the examination of the dry powder or crystals, whichever the case may be. If in the form of paste, a portion of the sample may be dried, powdered, and then treated as a dry dyestuff. The object of this examination is principally for the detection of mixtures of dyestuffs. It might be mentioned at this time that, while mixtures are not always objectionable, especially with the small consumer desiring the least amount of dyestuff on hand, it is often found that the dyehouse already has the dyestuffs on stock which are in the mixture. Water soluble colors are "blown out" on filter paper moistened with water; sulphur colors on filter paper moistened with sodium sulphide; and spirit soluble colors on paper moistened with alcohol. If a mixture, the several colors dissolve separately and show up very readily. Sometimes a sample contains two or more dyestuffs which give very nearly the same shade when blown out on filter paper, but if dusted onto concentrated H_2SO_4 show entirely different color reactions. Mixtures may also be detected by dropping a small portion of the powder into a glass cylinder nearly filled with water and observing the various particles as they sink and dissolve. A combination very difficult to detect is that in which two dyestuffs have been manufactured and mixed before salting out. In this case either the exhaust test or the capillary speed test will serve for detection. To conduct the exhaust test, a skein of either wool or cotton, depending on the class to which the dyestuff belongs, is entered into a bath of the dyestuff under examination, and the dyeing carried to completion. This skein is then removed and a second skein of the same material entered and treated as the first, without the addition of any further amount of dye solution. If the product is a mixture, the dyestuffs are not likely to exhaust to the same degree in the first dyeing and an excess of one will be left for the second skein. This will cause the latter to show an entirely different hue. The capillary speed test consists of suspending a strip of filter paper so that one end is immersed in a solution of the dyestuff under examination. The heights to which various solutions will ascend the strip of paper often vary considerably. To illustrate, if a solution of croceine scarlet is mixed with naphthol blue-black the water will rise the highest, then a band of scarlet will show followed by a dull blue, resulting from the mixture of blue-black and croceine scarlet.

Variations in Strength

Some judgment must be used, however, in connection with mixtures. It is very often the case in the manufacture of dyestuffs that successive lots are not absolutely identical in shade. It is perfectly legitimate in this instance to add small amounts of other dyestuffs possessing the same dyeing properties, for shading purposes, in order to keep the product "on shade." Neither does the admixture of the various so-called adulterants, such as common salt, Glauber salt, dextrine, etc., mean that a sample is inferior. Dyestuff, as manufactured, varies considerably in strength. One batch may come through two or three times as strong as the advertised type, while another may not be any stronger. Some inert substance having good solubility and no noticeable effect on the dyeing properties must be added in order that all deliveries may be constant in strength; otherwise the dyer, or color user, would be continually changing his formulae with each new delivery. With very few exceptions, the direct and sulphur colors are standardized with common salt or Glauber salt, and a small amount of soda ash to improve the solubility. Acid and other wool colors will contain Glauber's salt, while the basic, with few exceptions, are reduced with dextrine.

In some cases the presence of salt is detrimental. Such a case is in the manufacture of black inks containing hydrochloric acid, tannic acid, and ferrous sulphate.

A very pure grade of soluble blue, absolutely free from salt, is used. Should salt be present, an early precipitation of the tannate of iron occurs, doubtless due to the ionization of the HCl being depressed, thus allowing the ferrous iron to oxidize and combine with the tannic acid. Any adulterant of this sort may be readily detected by dusting a small amount of the dyestuff into a cylinder of water. Any salt present will drop rapidly to the bottom, leaving no color in its wake, while the dyestuff will sink leaving a trail of colored water behind.

Completing the Identification

After the examination of the dry powder, the chemist usually will have formed some opinion as to the nature of the dyestuff. If not, a simple method of identification is to determine the color reactions formed by the addition of acids and alkalis to a solution of the dyestuff. The identification is completed either by comparing the reactions with those published in the various textbooks or by actual comparison with a dyestuff of known composition. The latter is the simpler, since the designation of the colors as they are published in the references is often confusing. For example, Schultz's Farbstofftabellen gives the following color reactions for Congo Corinth B:

With HCl —Violet pp.
With NaOH —Cherry red solution.
With Con H_2SO_4—Blue solution which on dilution gives a violet pp.

The interpretations of the names "cherry red," "violet," etc., are not at all positive. Also, a great many of the Congos and Benzopurpurines will possess nearly the same changes if designated in this manner. That which is a violet to one colorist might be a red blue to a second, or even a blue-red to a third. A much better policy is to adopt a set of color standards, similar to those published in connection with Mulliken's Identification of Pure Organic Compounds (Vol. III, Commercial Dyestuffs) and refer all color reactions obtained to these cards. This, of course, applies to the less familiar dyestuffs and not to the very common compounds, such as Chrysamine, Congo Red, Acid Orange, Chrome Blue-Black, and so on, which will readily be recognized from the appearance of their solutions. If a sample is an entirely new product it cannot be identified in this manner and must be tested against the compound for which it may be substituted, in regard to its dyeing properties and for its money value.

After the examination of the dry powder the procedure becomes strictly one of comparison. For water soluble colors equal amounts of the dyestuff under examination, and the one with which it is to be compared, are weighed into flasks or beakers and dissolved in equal volumes of water. It is much better to use the same source of water as that which is used in actual practice, rather than distilled water. The dyeing properties are sometimes changed considerably when applied in actual application, due to certain impurities always present in the natural source. With the exception of sulphur and vat colors, which usually require large amounts of dyestuff for a single dyeing, direct weighings should be discouraged. A direct weighing is one where just enough powder is weighed out for the accomplishment of a single dyeing. As the weight of the material used in dye testing seldom exceeds 10 to 20 grams, the amount needed for a single test would not be greater than 0.2 to 0.3 grams. To obtain a representative sample it is much better to weigh out one to two grams, dissolve to a known volume, and take enough of the resulting solution to give the desired amount of dyestuff.

The importance of comparison cannot be too greatly emphasized, particularly in connection with direct cotton colors. The method of heating the dye pots should be such that all of these are at the same temperature, whether it be just under or at a boil. The amounts of dyeing assistants, or other chemicals, added must be carefully gauged. A point which often receives too little attention is the weight of the skeins or other material used in the dyeing. After being wound or cut, the material should be hung loosely for twenty-four hours before weighing, so that it may arrive at an equilibrium in regard to moisture content. Also, yarn weighed one day must not be used in dye tests with yarn wound and weighed on another day. The reason is apparent. Ordinarily, cotton fiber contains about 7 per cent moisture, but may absorb as high as 28 to 30 per cent (Knecht). Wool fiber contains about 16 per cent moisture but the amount may be greater or less, depending on atmospheric conditions. Thus the percentage of actual fiber present in skeins weighed on different days will vary perceptibly and may be instrumental in causing grave errors in comparative dyeings.

Concentration of the dye bath plays a very important part, particularly with the direct cotton colors where the degree of exhaustion depends very materially on this point.

Duplication of Practical Conditions

Actual practical conditions are difficult to copy in the dyeing laboratory as the dyeings are carried out on a very small scale. Those especially hard to duplicate are those of padding and chain dyeing where the time of immersion is so short, and the ratio of material to dye liquor so small. When the question is one of money value between two products identical in composition, it may be readily settled in the laboratory. If, however, the question is one of substitution with an entirely different product, the laboratory tests should be supplemented by tests in the dyehouse.

Quantitative methods for the estimation of dyestuffs are not of interest from a practical standpoint. Reduction methods, for determining the azo groups, while accurate enough for this purpose, do not tell whether the dyestuff is of the proper shade. Diazotization procedures for determining the amino groups usually give results too high. Secondary reactions in the coupling may give amino groups which do not represent coloring matter. This is noticeably so with Bismarck Brown, Chrome Blue-Black and similar colors. Also the shade which varies between wide margins is not shown.

Too much confidence should not be placed on dyeings made at some previous date. A great many colors, such as sulphurs and vats, change very much on cooling, and with slow oxidation. It is far better to make fresh comparative dyeings, even if the question is one of shade only. The product sample of the dry dyestuff or paste, as the case may be, is the only positive record for reference.

The various methods of dyeing the several classes of colors need not be covered in detail at this time, as different laboratories will have their own procedures, which will suffice as long as they are comparative. New colors, however, should be covered in detail. In the case of direct cotton colors dyed on cotton, the solubility of the color should be carefully noted, both in cold and hot water. Comparative tests are recommended to show the method by which the fullest and brightest results are obtained. Some will be found to work better in a neutral Glauber salt or common salt bath, while others require a small amount of soda ash to assist in leveling. Colors similar to Chrysamine will require phosphate of soda, or even the addition of soap. A great many colors are found to dye heavier shades slightly below a boil instead of the usual boiling temperature. The degree of exhaustion should be noted so that in the dyeing of compound shades, dyestuffs which exhaust to nearly the same extent may be selected.

The importance of this test is demonstrated when padding or similar processes are in use. If one dyestuff exhausts rapidly and another slowly considerable skill is required to keep the resulting shade constant.

Action of Metallic Salts

The action of metallic salts, such as chrome alum, chromium fluoride, copper sulphate and bichromate of soda, on the dyed shade should be ascertained. Very often the fastness to light and washing is considerably improved. A little time spent in determining the shade obtained when the dyeing is diazotized and coupled, with the various naphthols and naphthylamines is not always wasted. Coupling with diazotized paranitraniline often improves the washing fastness. The fastness of the resulting colors to the various color-destroying agencies should then be tried, particularly to light and washing.

Should the direct color be for use on mixed goods, equal quantities of cotton, wool and silk are dyed in one bath and the depth to which the several fibers are dyed noted. Some will be found to dye the vegetable fibers heavier than the animal; others will dye a solid shade, while a good proportion will be found to dye the animal fibers heavier. The temperature will also determine to a great extent the depth to which the different fibers are dyed.

When examining sulphur colors the amounts of sulphide of soda and soda ash necessary for complete solution should be carefully determined. Some will require a small amount of each of these chemicals while others will require an excess. If too little sulphide is used, the full coloring power of the dyestuff is not realized due to incomplete solution. Should too much sulphide be used the exhaustion is retarded. The amounts of color, sulphide, soda and salt necessary for standing baths is often of interest, as on heavy shades standing baths are essential for the sake of economy. Sometimes aftertreatment with metallic salts will "fasten" the shade, while rinsing with mild oxidizing agents, such as perborate of soda, will be found necessary to fully develop the shade. A great many sulphur colors, particularly those which reduce when dissolved, are best dyed just below a boil and not too violently agitated. Otherwise, considerable dyestuff is lost through premature oxidation, and streaky dyeings result.

Basic Dyestuffs

The new additions to the basic class are few. The principal property to examine in connection with this class is the solubility. Care must be used that they do not cake when dissolving and form tarry lumps which are very hard to dissolve. The members are not numerous and are seldom used other than on an antimony tannate mordant. For laboratory testing it is better to mordant with a good grade tannic acid combined with tartar emetic rather than sumac extract and patent antimony salts. The resulting mordant is much clearer and gives a better ground on which to judge the dyed shades. The dyeing temperature will be found to vary from 120 to 130 deg. Fahr. for Auramine, to 180 to 190 deg. Fahr. for other compounds not so easily decomposed.

With vat colors the amount of hydrosulphite and caustic necessary for complete reduction and solution should be determined as well as the temperature best suited for their absorption by the fiber. Too little hydrosulphite will cause the bath to be muddy and the material likely to show specky, due to undissolved dyestuff. Too much hydrosulphite will prevent the exhaustion of the bath. The temperature of the dyeing must be kept below a boil or the hydrosulphite will decompose but may be worked from room temperature, as with indigo, up to 150 to 160 deg. Fahr.

for some of the indanthrene class. Oftentimes Glauber salt may be added advantageously with certain of the indigo derivatives. With some dyestuffs of this class, such as those of the hydron blues, the hydrosulphite may be substituted in part or whole by sodium sulphide to materially cheapen the cost of the dyeing. For the full development of the shade, a bath of weak hypochlorite of soda is often helpful, while for others a boiling soap bath will suffice. The temperature and length of time necessary for complete reduction and solution is essential. Those derived from anthraquinone reduce rapidly while some of the indigoid class need to stand overnight. The additions necessary for standing baths should be determined, particularly for heavy shades, where fresh baths for every set would be very expensive.

The Acid Colors

Acid colors will require considerable attention. The degree to which the bath exhausts and the agents necessary for exhaustion are quite important. The action of the dyestuff in a neutral Glauber salt bath is first determined. A considerable number will be found to dye readily in this manner and serve as shading colors for union dyeing. A great many of this class exhaust rapidly with acetic acid while others will require a large amount of sulphuric. The best results for compound shades are obtained when dyestuffs are selected which exhaust nearly to the same degree by the same method. Some products will be found which work very satisfactorily with bisulphate of soda or acetate of ammonia, or similar compounds which supply the acidity slowly. When testing acid colors it is well to tie small pieces of silk and cotton on each skein, to show the action on mixed fibers. The dyer will be materially assisted if he knows exactly how the dyestuffs act when silk or cotton are present, either as union material or as effect threads. Small pieces of copper and iron may be added to the dye bath to determine the fastness toward metal parts in the dyeing machines. A good many will be found worthless when used in machines with iron parts. The fastness of a great many of this class may be improved by afterchroming, and when determined permits their use in conjunction with the afterchrome colors.

Complete reference for chrome colors calls for a large number of dyeings. They should be dyed at least four methods:

1. As an acid color.
2. As a chrome bottom color.
3. As a metachrome or chromate color.
4. As an afterchrome color.

The first method will separate a lot of the so-called chrome colors from the true members of this class. Common examples of this are Azo Rubine and Acid Violet 5R which are often sold as chrome blues. It is obviously unnecessary to purchase a chrome blue which, when dyed as an acid color, turns out to be either of the above-mentioned products. Dyeing first as an acid color also shows the shade obtained before chroming as well as the method by which the most even results are obtained.

The second method will show the dyer the products he may use in conjunction with the true Alizarine colors. Some dyestuffs, such as the Chrome Green made from picramic acid and H acid, do not develop their true shade unless afterchromed. These, of course, are worthless if the dyer is working on chrome bottomed stock.

Classification by Dyeing Properties

The third and fourth methods are for the same purpose, namely, to classify the samples according to their dyeing properties. A few will be found which will dye equally efficient by all methods. Others will be of no value by other than one method, such as the true alizarines which will dye as chrome bottom only. As with acid colors, a small piece of silk should be attached to the dyeing to demonstrate its worth for leaving effect threads clean. The sensitiveness to metals should also be tested by placing small bits of the metal in question into the dye bath. Dyestuffs with polychromic properties are readily discovered by dyeing on skeins mordanted with other metallic salts, such as those of iron, aluminium, copper and tin.

When the dyeing properties of the various classes of dyestuffs are completed, whether they are on wool or cotton, the fastness to the various color destroying agencies must be tested. The requirements will differ according to the agent to which the material is to be exposed. However, the laboratory should not confine itself to one or two particular tests, but should run through the whole list for the sake of reference. Every well regulated laboratory will have its standard methods which, to repeat, are of value only when they are carried out in comparison with a standard of known usefulness.

The leather chemist will classify the colors a little differently. He does not care particularly to which class the dyestuff belongs, but is interested in the results he obtains on the various types of leather. The dyeing process must be simpler, as the material cannot be boiled. Readily soluble colors with not too rapid exhaustion are desired for level results. The physical properties are more carefully examined, particularly the solubility in fats, oils, alcohol, etc., as these materials which are used in the finishing are very often colored and take the place of dyeing to a great extent.

The paper or pulp mills will look for other properties. Dyestuffs which dye bright shades, do not exhaust too rapidly and which give a clear backwater are very desirable compounds. Dyeings are made on the different varieties of pulp or paper stock which may

be in use, and the dyed stock subjected to the various fastness tests depending on the uses to which the finished material is subjected.

It is very difficult to lay down specific methods of examination which will apply for all the uses for which would not interest the cotton mills in the least. It is the chemists' duty to devise methods which will approximate the practical method as nearly as possible and keep them constant.

The interpretation of the results of these dye trials will depend on the sensibility of the observer's eye. The results are not nearly as accurate as the analytical chemist has been taught to work, as 5 per cent strength is difficult to detect with certain colors, particularly the yellows. Slight shade differences are often mistaken for strength or weakness.

Greenness when examining yellows is often mistaken for weakness, and redness for strength. The error in this case is readily discovered should the yellow be a component for a brown mixture with black and red. We will say the yellow has been judged 10 per cent stronger than the standard, due to redness, and the percentage of yellow cut down proportionately in the mixture. When the tests are made it will be found that the brown does not possess the proper amount of yellow. The amount of yellow left out, and also some additional, must be added to give the compound shade the proper tone, as the yellow dye did not contribute enough pure yellow.

The practice of testing dyestuff for strength by dyeing the one in question with a second to form a compound shade is not always trustworthy. It permits the introduction of another possibility of error, unless carried out very carefully. When solutions of two products are shaded to one dye bath it necessitates two measurings and an error in either measuring will cause the dyeing to be inaccurate. Variations in tones are hard to interpret. To illustrate, we may dye two skeins a four-ounce shade of direct blue on cotton yarn and then take each skein and redye with a one-pound shade of two direct yellows with a slightly different tone. Should one of the yellows be slightly redder than the others, the admixture of the third primary color will cause the resulting green to be duller. Should the yellow be purer, that is, with less red element, the resulting green would be of a purer tone but with the comparative strength still an unsettled question. However, if this method is desired in order to eliminate the possibility of one error, it is much better to dye a large number of skeins a four-ounce shade of blue in one bath so that each and all are of exactly the same strength and tone, and then top with the desired amount of the component color.

Accurate dyeing methods and proper judgment of the dyeings thus obtained is the foundation of the color laboratory. One is useless without the other. Slovenly and inaccurate work will cause a great deal of trouble but no more so than poor judgment of an accurate set of dyeings.

The Mordanting of Worsted Piece Dyes for Certain Fast Chrome Colors

By KARL R. MOORE

Stillwater Worsted Mills, Harrisville, R. I.

IT has, no doubt, been noted by all who have been employed in dyeing worsteds in the piece on a chrome bottom that when using the commonly prescribed proportions of chrome and tartar, viz., equal quantities, or two of chrome to three of tartar, or three to five, that the decomposition of the tartar and the reduction of the chrome which begins when the boil is reached does not proceed to completion, but that after a certain time no further reaction takes place, regardless of how long boiling is continued. The liquor remains of a faint yellow color showing the presence of unaltered bichromate and the cloth is of a greenish shade.

On examination of the liquor after the completion of chroming it was found that the amount of chrome still remaining in the bath varied somewhat in different kettles, even though charged with the same quantities and having cloth of the same style. The chromed cloth also showed slight variations in shade.

Those who are users of the fast chrome colors such as the chrome blue-blacks for the production of blue serge shades are well aware of the strong affinity of this dyestuff for chrome, and of the insoluble nature of the product.

It is also well known that some of these colors when dyed on a mordant of unreduced chrome produce a dull slate shade, while with a perfectly reduced chrome a fast and brilliant shade of navy blue results. For those, therefore, who are interested in obtaining the maximum of brilliancy and bloom from this group of colors as well as uniformity in tone from kettle to kettle it is highly important not only to use such an amount of chrome as is actually required for chemical combination with the dyestuff used, but also to be sure that all the chrome is precipitated and completely reduced as if a surplus of chrome is present on the

cloth it greatly retards penetration due to the dyestuff forming insoluble compounds on the surface of the cloth, while if the chrome present is not completely precipitated it has a tendency to diffuse back into the bath during dyeing, thus precipitating the dyestuff. A surplus of acid reducing agents in the mordanting bath is equally harmful as in this case the oxide of chrome that has been precipitated may be dissolved again into the bath.

Having in mind some of these causes for variable results, it was determined to dye several sets, using different assistants following in all cases with the same amount of the same dyestuff. The chrome and tartar employed were the same as supplied to the textile trade the tartar containing about 35 per cent argol, while the dye used was the Chrome-Blue-Black listed in Schultz under No. 181.

Upon looking into the molecular weight with a view to ascertaining what is required by chemical equation it was found that the blue-black had a molecular weight of 384 as a pure substance, and was monobasic. Allowing a commercial purity of 77 per cent would give 500 as an assumed molecular weight. Being monobasic, it would require six molecules to satisfy the valence of the chromium in the bichromate. The weight of black required, therefore, to combine with the molecular weight of the bichromate would be 3,000 parts. As the molecular weight of the bichromate is roughly 300 this gives a theoretical proportion of ten to one, that is, one-half per cent of the blue-black. Practical considerations of dyeing will not permit such exact calculations, however, as due to the nature of the fiber the methods of absorbing the dye and charging the bath, etc., it is not possible to enter the dye into chemical combination with all of the chrome on the cloth. This calculation, however, is sufficient to show that no such amount of chrome as is called for in recipes for dyeing with this color and those of similar construction isnecessary,and that the surplus of chrome frequently present is a handicap in the production of well-penetrated dyed goods and if not completely reduced will diffuse back into the dye bath during dyeing precipitating dyestuff and dulling the shade.

In order to determine as nearly as possible just what proportions of chrome were practical and best suited to the dyestuff under consideration the following proportions were tried out on sets of eight pieces:

Trial No. 1, *Using* 3 *Per Cent Chrome,* 3 *Per Cent Tartar,* 3 *Per Cent Dyestuff.*—The shade of the chromed cloth after mordanting with this proportion was of a yellowish green, while a slight surplus of chrome remained in the bath. After dyeing the cloth showed poor penetration and a two-color effect. The tone of the shade was dull and lacking in bloom.

Trial No. 2, *Using* 3 *Per Cent Chrome,* 5 *Per Cent Tartar,* 3 *Per Cent Dyestuffs.*—Penetration about the same as No. shade, somewhat brighter; a slight difference in shade from set to set.

Trial No. 3, *Using* 1.5 *Per Cent Chrome,* 4 *Per Cent Tartar,* 3 *Per Cent Dyestuff.*—The penetration was good on this mordant but the shade is undeveloped and poor unless the cloth be boiled an extra long time in the dyeing operation. If this is not done, not only will the shade be undeveloped, but the color will not all be fixed, and will run in the scouring after dyeing.

Trial No. 4, *Using* 2 *Per Cent Chrome,* 8 *Per Cent Tartar,* 3 *Per Cent Dyestuff.*—The penetration on this set was good and the shade was well developed. There was practically complete precipitation of the chrome, though it was not reduced, even with the large percentage of tartar, as far as it is possible to carry the reduction. This mordant also showed very uniform results from kettle to kettle.

Trial No. 5, *Using* 1.35 *Per Cent Chrome,* 2.65 *Per Cent Lactic,* 0.9 *Per Cent Sulphuric,* 3 *Per Cent Dyestuff.*—These assistants gave complete precipitation of the chrome, the breaking down of the bichromate taking place below the boil between 160 and 210 deg. Fahr. The wool is left a bluish green in shade after mordanting. On dyeing the dyestuff goes on below the boil, the shade developing as it goes on the cloth. The penetration is good and the shade is of about the same brilliancy as in trial No. 4.

From the results of the above experiments we may conclude that a considerable saving in chrome can be made with certain dyestuffs and that the shades produced with less chrome and more tartar will be purer and faster in every respect against scouring and light as the combinations of the pure oxide of chromium with dye is superior in every respect to combinations of the latter with chromates and intermediate products. The fiber will also remain softer and more brilliant as the wool is only charged with the pure oxide of chrome and only with the quantity of mordant necessary for dyeing without any other useless products. A greater regularity of shade may be produced as the end of the mordanting operation is easily apparent as the liquid is quite discolored and the wool is always reduced to the same degree.

RICE FUR DYEING PATENT DECISION

In a decision handed down in the United States District Court of St. Louis Judge Faris granted an injunction against use of the Rice process of dyeing sealskins by the International Fur Exchange, Funsten Bros. & Co. and Gibbons & Lohn Dyeing & Dressing Company, and ordered the companies named to make an acounting to Rice, Ltd., of London, for use of process since 1916, when it was first brought to this country by John Charles Lohn, a former employee of the Rice Company. The case was tried several months ago.

According to allegations of the English dyers, defendants have been using a secret dyeing process owned exclusively by the Rice Company, causing plaintiff more than $100,000 financial loss.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Advisory Editor

LAURANCE T. CLARK
Managing Editor

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THE DIE IS CAST

AFTER approximately five years of uncertainty, during which time the American dyestuff industry has been alternately encouraged to expect complete protection and threatened with immediate extinction, Congress has at last enacted legislation which may be classed as "quasi protective."

The measure, as it now stands, provides for a duty of 7 cents per pound specific and 60 per cent ad valorem, based on American valuation, for finished dyestuffs when these goods compete with American-made products. There is only one feature of the measure which is wholly good—it terminates the period of uncertainty which for the past several years has made it impossible for American dyestuff manufacturers to know what their status might be at any given time in the future. From now on they can at least reckon upon future conditions with reasonable certainty. From the standpoint of adequate protection, however, the measure is woefully lacking. It is true that bulk colors which are being manufactured and merchandised at a price of 50 cents per pound, or less, enjoy a surplus of protection under this measure—its provision constitutes an absolute embargo so far as products of this class are concerned. When one runs up the scale of advancing prices, however, he soon comes to products where keen competitive conditions will exist, and, beyond these, to types of colors which it would seem must be destined to extinction so far as American production is concerned. This is most lamentable, for it is here that American manufacturers have expended their greatest effort, the fruits of which were just on the point of ripening.

That the larger and better entrenched of our dyestuff manufacturers will be able to continue their existence under the present measure seems to be a fairly safe assumption. But that they will be able to continue the manufacture of the more expensive and greatly needed colors, to prosecute research along these lines, seems practically impossible. Smaller manufacturers, particularly those who are engaged in the production of a limited number of higher priced specialties, will find it extremely difficult to exist.

Throughout all the discussions which have centered about the question of dyestuff protection, one feature calls for special condemnation by those who are truly American at heart. This is the fact that times without number representations as to costs and industrial conditions in the dyestuff field, made to our legislators by American manufacturers, have been subjected to aspersions as to their accuracy and even open challenges as to their truth, while similar representations made by the agents of German manufacturers have seemed to be accepted at their face value. That such a condition should exist in our legislative circles is reprehensible in the extreme and cannot fail to fill any thoughtful American with grave doubts as to the common sense, and even the integrity, of some members of our legislative bodies.

This is not meant, by any manner of means, as a blanket indictment of all members of our national Legislature—it is intended rather for a small minority, but a minority which by its extreme activity has misled and deceived its fellows. On the other hand, in the persons of many eminent legislators, of which such men as Senators Frelinghuysen and Ransdell and Representative Longworth are typical, there have been outstanding examples of the clear-thinking, loyal Americans who ought to constitute an overwhelming majority of our national legislative body.

Now that the status of dyestuff importations is definitely settled for the time being, it behooves all members of the American dyestuff manufacturing industry to cease worrying over legislative matters and devote themselves wholeheartedly to the manufacture and distribution of dyes. A certain amount of protection has been granted—enough, if properly administered, to permit competition with Germany in the major part of our dyestuff requirements.

Our American dyestuff manufacturers are not quitters. They have been accused at various times of being monopolists, grafters, liars, octopi and other things too horrible for words, but, to the best of our knowledge and belief, not even Senator Moses himself can accuse them of failing to fight to the last ditch for what they wanted. To-day they want to see the American textile and other dye consuming industries adequately supplied with American made dyes and, if it is humanly possible, they will do it.

THE NINTH CHEMICAL SHOW ?

WHATEVER varying opinions as to minor details and individual exhibits may have been held by those who attended or exhibited in the Chemical Show this year, the majority did not hesitate to express the view to REPORTER representatives that a falling off

was visible. Certainly was this true in the case of the dye manufacturers; with National, Du Pont and other important organizations not represented, there was a distinct gap here.

As a matter of fact, the dye people, very rightly it would seem, had about made up their minds that the Chemical Show is far from being as good a medium for the display of their wares and the conveyance of their message as are the Textile Show and the Silk Show. In the case of the latter, particularly, this journal has repeatedly urged its entire suitability—indeed, its manifest advantages—as a proposition for the best exhibitive efforts of the dye manufacturers, and it is sincerely to be hoped that they will not fail to participate as active exhibitors in the forthcoming Silk Show next February—nor fail, either, to take full advantage of the nation-wide Silk Week publicity which is part and parcel of the purposes responsible for this Show. The Textile Exposition, of course, already finds patronage from the dye people, and logically so.

To return to the subject which forms our title, the outcome of the controversy arising over the Ninth Chemical Show is being awaited with some interest. A former co-manager of the Show submitted to exhibitors this year a plan for a co-operative exhibition which, it was declared, would enable it to be conducted at a rental cost of less than $1.00 per square foot. The proposal is to hold the Show in Madison Square Garden and in the Sixty-ninth Regiment Armory, a block distant, during the week of September 17. Advantages urged are that most of the successful industrial expositions are now conducted under co-operative management, that rental charges are to be made on a basis of $1.50 per square foot with the understanding that at the end of the year an audit and report will be made and the money left after all expenses have been paid will be returned to exhibitors as a pro-rata dividend, that the new management can "win back the big exhibitors who have dropped out of the Chemical Show and the enthusiastic support of the National Societies," and that "co-operative management will insure not only a less costly Show, but a better Show in every way"—though just what way is not specifically stated.

To all of which the International Exposition Company, after announcing price reductions of its own, replies that the Ninth Chemical Show during the week of September 17 at Grand Central Palace will be "equally as successful as all previous Expositions," that the Chemical Show, not being strictly a box-office proposition charging exhibitors for their tickets as is done with the Automobile Show and many others, cannot be operated in New York on a basis of $1.50 per square foot unless advertising and other needed expenses are curtailed to the detriment of exhibitors, that the company's experience in Chicago several years ago indicated that to divide an Exposition between two buildings was not beneficial to the exhibitors in the smaller building, that the company, instead of depending upon exorbitant profits from one exposition, relies on efficient management to obtain a fair business profit on all the various expositions staged by it each year; that it is composed of men thoroughly experienced in this particular field who are competent to overcome the numerous obstacles with which an untried and inexperienced management would be unable to cope, and that since the hazards of this class of enterprise are greater than is the case with most businesses, only a well-established firm can make the big investments required to meet the public liability and other contractual liabilities—necessarily assumed for a long period in advance—before returns can be obtained; and this, it is held, is beyond the powers and daring of an individual or newly organized company.

These points, in the main, are well taken; but, on the other hand, the rival management claims—at the present writing—to have secured the patronage and indorsement of more than fifty of this year's exhibitors. Hence, it would seem that New York City and the chemical industries will be treated to the spectacle of two Chemical Shows, each bidding for the attention of trade and public. Neither management, at the moment of going to press, apparently has any thought of capitulating, and the prospect for September 17, 1923, is indeed interesting—one may say deplorably so!

Such a division of interest, if it takes place, could not but operate to the worst interests of all concerned. The only ultimate good which could be hoped for would be the creation of so much dissatisfaction as to clear the atmosphere and insure a new deal all around. Advocates of the co-operative plan are said to be numerous in the ranks of the chemical industries. There are likewise many who hold that once every two years is often enough for a Chemical Show. Whatever final decision is reached, and whether the industries involved must wait a year and go through with the undignified farce of holding two Shows in the same week—and one of them under two separate roofs at that—before the decision can be made, will be strictly up to the parties involved. If they are prudent, it would seem that they might well get together before the snow flies and come to some sort of an agreement mutually satisfactory. Better a yielding and a compromising by all, and better a pocketing of pride, than that the Chemical Show, as a national institution, should, with its obvious benefits, be jeopardized or fall into disrepute with the very public and trades which it strives to influence.

Meanwhile, present indications are that the dye manufacturers are pretty definitely out of the threatened imbroglio, and for this there is reason to be thankful. It would appear that the Silk Show and the Textile Show are its logical fields for exhibition purposes, and that any attempt to exhibit at future Chemical Shows should be regarded rather in the light of a luxury than a necessity.

Despite the fact that the current Congress has removed the legislative future of the dye industry from the field of controversy, it should not for a moment be supposed that the necessity for "selling" the industry to the public has passed. This remains, as always, of prime importance, and whatever may be decided in the case of the Chemical Show, the dye people should not overlook the approaching Silk Show.

Internal Strife Halts Italy's Plans for Tax Exemption of Foreign Capital

By RAFAELE SANSONE

Genoa, August 14.
Special to The Reporter.

DURING the last five weeks the precipitate fall in the value of the Italian lira was checked, bringing the value of the United States dollar from 22.50 lire to 22 lire and the value of the English pound sterling from 101.50 lire to 98 lire, and even lower. Such conditions caused some of the prices to continue in their rise, while others, because of special conditions, stocks available, or the low demand of consumers, either remained unchanged or even dropped slightly. The fall of the Italian Ministry—which was, however, soon restored to power by the same Prime Minister—and a general strike, the effects of which were abated through the intervention of nationalistic (fascisti) organizations, which acted as strikebreakers in the principal public services, all combined to influence the price situation. Trains could be run and some of the post office operations could be continued, but the fall of the Ministry suspended for the time being the reaching of any decision regarding the proposed legislation exempting foreign investments in Italy from income tax until the end of 1925. As a consequence of the agitation in industrial circles, the Italian color works were metamorphosed into supporters of the abolition of the present importation prohibition on coloring matters, though holding out strongly, however, for compensation through a radical increase in import duties. This new increase in the duties encountered strong opposition, it being held that the resulting increase in prices would fall on the consumers—imparting to the question also a political character. The labor organizations were also averse to the new project. The decision of the Italian Government on this important question was being awaited at the present writing: meanwhile a new company with a capitalization of 1,000 lire was founded at Milan, under the name of Abbondio Faverio, for the importation and sale of aniline coloring matters and chemicals for the industry!

The demand for direct coloring matters was still good, and so was that for basic coloring matters, sulphur dyestuffs, and acid wool colors. A certain number of orders were noted for paranitraniline, often passed by old Turkey red dyers, who often preferred this color to alizarine owing to its greater facility of application and great brightness of shade when properly dyed. The usual demand for indigo was noted, especially on the part of the works supplying fabrics to the Royal and mercantile navies, whereas for other vat coloring matters such as indanthrene, flavanthrene, the Ciba colors, etc., the demand was scarce and limited principally to works dyeing small lots of yarn to be woven in white toweling, or as the borders of white fabrics, by themselves, or with other yarns dyed in paranitraniline, chrome yellow, chrome orange, etc.

The quotations of war reparation dyes in Table I, per ton in lire and dollars, show the reductions taking place in the lira and dollar prices, at the moment of writing, in comparison with the price prevailing at the beginning of June:

Considering the great rise in the foreign exchange, especially in the case of England and of the United States, the prices of mordants, assistants, dyehouse products, etc., were received but little changed; this

TABLE I

	July 10 to August 10 (lire)	July 10 (dollars)	August 10 (dollars)
Naphthol Yellow	40,000—65,000	1,777—2,888	1,888—2,954
Auramine	60,000—70,000	2,666—3,111	2,727—3,181
Orange II	22,000—25,000	977—1,111	1,000—1,136
Nigrosine, water soluble	28,000—35,000	1,244—1,555	1,272—1,590
Nigrosine, soluble in alcohol	30,000—38,000	1,333—1,688	1,363—1,727
Sulphur Black	7,000— 9,500	311— 422	318— 431
Acid Black	30,500—34,500	1,355—1,533	1,386—1,568
Direct Black	30,500—34,500	1,355—1,533	1,386—1,568
Chrome Black	34,000—37,000	1,511—1,644	1,545—1,681
Methylene Blue	75,000—90,000	3,333—3,999	3,409—4,090
Direct Blue	24,500—28,000	1,088—1,244	1,113—1,272
Sulphur Blue	33,500—37,500	1,488—1,666	1,522—1,704
Malachite Green	75,000—90,000	3,333—3,999	3,409—4,090
Acid Green	60,000—70,000	2,666—3,111	2,727—3,181
Direct Green	41,000—54,000	1,844—2,400	1,886—2,454
Bismarck Brown	35,000—41,000	1,555—1,844	1,590—1,886
Magenta (Fuchsine) Crystals	10,000—80,000	3,111—3,555	3,181—3,636
Eosine	50,000—75,000	2,222—3,333	2,272—3,409
Ponceaux	28,500—32,500	1,266—1,444	1,295—1,477
Methyl Violet	65,000—80,000	2,888—3,555	2,954—3,636

TABLE II

	August 9 (lire)	August 9 (dollars)		August 9 (lire)	August 9 (dollars)
Acetate of alumina	1,600	72	Bisulphite of soda, 32 deg. Be...	380	17
Chrome alum	3,000	136	Chlorate of potash	3,200	145
Bichromate sulphate	5,700	259	Chloride of ammonia	5,000	227
Ferrous sulphate	500	22	Bleaching powder	900	40
Copper sulphate	2,100	95	Nitrite of soda	3,000	136
Tartar emetic	12,000	545	Yellow prussiate of potash	13,000	590
Aniline oil	10,000	454	Yellow prussiate of soda	9,000	409
White refined glycerine	6,400	290	Caustic soda, 70/72	2,000	90
Glucose, 45 deg. Be.	3,900	177	Silicate of soda, 140 deg. Tw.	1,000	45
Hydrogen peroxide	2,100	95	Sodium sulphite	2,600	118
Tartaric acid, crystal	10,750	488	Logwood extract	7,000	318
Tannic acid, 60 per cent.	20,000	909	Yellow dextrine	4,000	181
Acetic acid, 30 per cent.	2,800	127	White dextrine	4,250	193
Hydrochloric acid	300	13	Farina	3,500	159
Formic acid	11,000	500	Kordofan gum	4,900	222
Lactic acid, 80 per cent	4,000	181	Indigo, 25 per cent	22,000	1,000
Alum	1,000	45	Beta-naphthol	18,000	818
Ammonia, 22 deg. Be.	1,450	65	Industrial castor oil	5,250	238

owing to their already great height and to the strong bargaining that the signing of every contract brought about. Besides this the war reparation products received, and those imported freely, or privately, from Germany, acted as regulators, often ousting the products of other countries. Some of the lira and dollar quotations are given, per ton at Milan, in Table II:

Some private quotations for dyestuffs at Genoa were as follows, per kilo, showing how these competed against the war reparation products: Nigrosine, crystals, 26 to 30 lire; chrome black in powder, 34 to 36 lire; acid black, 32 to 35 lire; direct black, 32 to 35 lire; direct green, 48 to 54 lire; liquid fustic extract, 7 to 7.50 lire; logwood extract, 7 to 7.50 lire; hematine crystals, 8 to 8.50 lire.

Foreign Dyes Licensed by Treasury Department for August Import

The monthly list of foreign dyestuffs imported into the United States shows a total of 466,858 pounds sent in during August from all sources. France contributed 2,311 pounds of this total with the first shipment she has furnished in many months, while Germany led all in total sales with the imposing poundage of 238,174, a heavy gain over her July shipments of 130,386 pounds.

The gain of Switzerland, however, was even more striking, the country of cantons running from a total of only 47,406 pounds in July all the way up to 212,830 pounds in August. Of the quartet regularly supplying us with non-competing dyestuffs and specialties, England was the only one to record a falling off in shipments, her poundage being 13,543, as against 17,690 in July. The detailed list follows:

Designation of Dye	Germany (lbs.)	Switz. (lbs.)
Acetate of Magenta	50	....
Acid Anthracene Brown PG	1,000	....
Acid Cyanine BF	1,100	....
Acid Milling Red G	....	1,000
Acid Pure Blue R Supra	....	1,500
Acid Rhodamine BG	500	....
Acid Rhodamine R	....	1,100
Algol Black 100% Powder	100	....
Algol Blue 100% Powder	100	....
Algol Brilliant Red 2B	1,000	....
Algol Brown G	584	....
Algol Brown R Paste	2,010	....
Algol Green 100% Powder	100	....
Algol Orange 100% Powder	100	....
Algol Pink 100% Powder	100	....
Algol Red FF Extra Paste	500	....
Algol Red (other than R) 100% Pdr.	100	....
Algol Violet 100% Powder	100	....
Algol Yellow (other than R) 100% Pdr.	100	....
Alizarine Astrol B	200	....
Alizarine Black WX Extra Paste	500	....
Alizarine Blue S Powder	6,000	....
Alizarine Blue SAE	100	....
Alizarine Blue Black B	3,300	....
Alizarine Blue Black BT	200	....
Alizarine Direct Violet ER Powder	50	....
Alizarine Fast Gray 2BL	500	....
Alizarine Geranole B Powder	85	....
Alizarine Green S Paste	2,000	....
Alizarine Green S 15% Paste (from England 1,000 lbs)	....	....
Alizarine Indigo 5R	930	....
Alizarine Irisol R Powder	29	....
Alizarine Maroon 20% Paste	1,502	....
Alizarine Red IWS Powder	500	....
Alizarine Red S	1,500	....
Alizarine Red SWB Powder	230	....

Designation of Dye	Germany (lbs.)	Switz. (lbs.)
Alizarine Rubinole 3G	200	....
Alizarine Rubinole R	1,730	....
Alizarine Saphirole SE	50	....
Alizarine Saphirole WSA	225	....
Alizarine Sky Blue B Powder	350	....
Alizarine Viridine FF	4,100	....
Alizarine Yellow Lake C (from England 1,000 lbs.)	....	....
Alkali Fast Green 3G	100	....
Anthosine 3B	1,000	....
Anthracene Blue SWR	200	....
Anthracene Blue WB Paste	10,000	....
Anthracene Chromate Brown EB	525	....
Anthraflavone GC	250	....
Anthraquinone Blue SE Extra Powder	100	....
Anthraquinone Blue SR Extra Powder	100	....
Anthraquinone Green GXNO	100	....
Anthrazurine G	1,000	....
Auramine G	....	110
Benzo Bordeaux 6B	225	....
Penzo Chrome Brown 5G	120	....
Benzo Fast Blue 4GL	1,390	....
Benzo Fast Bordeaux 6BL	1,050	....
Penzo Fast Brown GL	500	....
Penzo Fast Brown RL	10	....
Benzo Fast Heliotrope BL	135	....
Penzo Fast Heliotrope 4BL	200	....
Benzo Fast Heliotrope 2RL	25	....
Benzo Fast Orange 2RL	560	....
Benzo Fast Red 8BL	1,800	....
Benzo Fast Yellow 4GL Extra	110	....
Benzo Fast Yellow RL	225	....
Benzo Red 12B	500	....
Benzo Rhoduline Red B	210	....
Benzo Rhoduline Red 3B	137	....
Bluelake	700	....
Brilliant Benzo Green B	180	....
Brilliant Benzo Violet B	1,300	....
Brilliant Carmine L Conc	100	....
Brilliant Congo R	25	....
Brilliant Copper Blue GW	100	....
Brilliant Delphine Blue	....	3,000
Brilliant Geranine B	100	....
Brilliant Sky Blue 8G Extra	300	....
Capri Blue GON	25	....
Chinoline Yellow KT Extra Conc	850	....
Chloramine Red 8BS	50	....
Chlorantine Fast Rubine RL	....	770
Chlorantine Fast Violet 4BL	....	1,210
Chlorantine Fast Yellow RL	....	3,080
Chromeazurine G	....	1,100
Ciba Blue 2B	....	1,540
Ciba Blue 2BD	....	11,000
Ciba Blue 2BD	....	11,924
Ciba Bordeaux B	....	1,100
Ciba Green G Paste	....	1,265
Ciba Gray G Paste	....	1,320
Ciba Pink B Paste	....	1,100
Ciba Red G Paste	....	4,356
Ciba Red R Paste	....	660
Ciba Scarlet G Powder	....	2,200
Ciba Violet B	....	15,400
Ciba Violet R Paste	....	7,084
Ciba Yellow G Paste	....	3,058
Cibanone Blue G	....	1,540
Cibanone Blue 3G Paste	....	12,540
Cibanone Green B	....	12,100
Cibanone Olive B	....	880
Cibanone Orange R	....	5,434
Cloth Fast Brown G	....	110
Cloth Fast Brown 5R	....	110
Cloth Fast Brown 2R	....	220
Cloth Fast Green B	....	1,705
Cloth Fast Brown G	....	110
Cloth Fast Orange R	....	110
Cloth Fast Orange G	....	110
Cloth Fast Red B	....	110
Cloth Fast Red 3B	....	110
Cloth Fast Red GR	....	110
Cloth Fast Red R	....	110
Cloth Fast Violet B	....	110
Cloth Fast Violet R	....	110
Cloth Fast Yellow G	....	110
Cloth Fast Yellow R	....	110
Corvoline BT Lumps	100	....
Cross Dye Green 2G Conc. (from England 600 lbs.)	....	....
Crystal Violet Extra	225	....
Cyananthrol BGAOO	1,920	....
Cyananthrol RXO	45	....
Cyanol Extra	550	....
Cyanole FF	880	....
Diamine Azo Blue R	40	....
Diamond Black No. 1	11,050	....
Diamine Blue Black B	10	....
Diamine Brilliant Rubine S	1,100	....
Diamine Brilliant Scarlet S	800	....
Diamine Bronze G	37	....
Diamine Brown B	200	....
Diamine Catechine B	799	....
Diamine Catechine G	300	....
Diamine Catechine 3G	298	....
Diamine Fast Blue CG	1,550	....
Diamine Fast Brown 3G	70	....
Diamine Fast Brown GB	500	....
Diamine Fast Brown R	200	....
Diamine Fast Orange EG	720	....
Diamine Fast Orange ER	825	....
Diamine Fast Orange F	100	....
Diamine Fast Red 8BL	1,100	....
Diamine Fast Violet FFBN	25	....
Diamine Heliotrope G	220	....
Diamine Light Red 8BL	2,000	....
Diamine Orange B	100	....

Designation of Dye	Germany (lbs.)	Switz. (lbs.)
Diamine Scarlet 3B	10	....
Diamine Yellow N	80	....
Diaminogene Blue NA	1,300	....
Diaminogene Blue NB	700	....
Diaminogene Blue NBB	9,200	....
Diaminogene Extra	200	....
Diaminogene Sky Blue N	300	....
Diamond Black No. 1 (pigment for varnish)	500	....
Diazamine Blue BR	....	7,500
Diazine Black G	500	....
Diazo Bordeaux 7B	105	....
Diazo Brilliant Black B	950	....
Diazo Brilliant Green 3G	450	....
Diazo Brilliant Orange 5G Extra	50	....
Diazo Brilliant Orange GR Extra	10	....
Diazo Brilliant Scarlet B Extra	25	....
Diazo Brilliant Orange 2BL Ex. Conc.	275	....
Diazo Brilliant Scarlet 5BL Ex. Conc.	25	....
Diazo Brilliant Scarlet 6B Extra	100	....
Diazo Brown 3G	410	....
Diazo Brown 3RB	250	....
Diazo Fast Bordeaux BL	10	....
Diazo Fast Violet 3RL	50	....
Diazo Fast Yellow 2G	100	....
Diazo Indigo Blue 4GL Extra	200	....
Diazo Indigo Blue 2RL	500	....
Diazo Light Green BL	50	....
Diazo Light Violet BL	50	....
Diazo Rubine B	600	....
Diazo Sky Blue 3G	100	....
Diphenyl Brown BBNC	....	5,750
Diphenyl Catechine G	....	3,500
Direct Fast Violet B	100	....
Direct Red G	10	....
Direct Red 8B	10	....
Eclipse Brown BK	....	1,000
Eclipse Brown 3GK	....	1,500
Eosamine B	3,000	....
Eosine B	50	....
Erika B Extra	100	....
Erio Chrome Azural BX Conc	....	6,600
Erio Chrome Black A	....	11,000
Erio Chrome Black E	....	2,500
Erio Chrome Brown ROS	....	110
Erio Chrome Flavine A Conc	....	2,000
Erio Chrome Phosphine RR	....	2,000
Erio Chrome Red B	....	2,500
Erio Chrome Red G	....	1,000
Eriocyanine AC	....	3,510
Erio Fast Cyanine SE	....	1,500
Erioglaucine AP	....	3,910
Euchrysine GRNTN	200	....
Euchrysine RRDX	500	....
Fast Green Extra Bluish	3,000	....
Fast Green Ex. Bluish 60/100 Conc.	2,200	....
Fast Green Extra Bluish Conc	220	....
Fast Light Green	500	....
Fastigen B	2,510	....
Geranine G	425	....
Hansa Yellow G	2,000	....
Helindone Brown AN Paste	25	....
Helindone Brown G Powder	172	....
Helindone Fast Scarlet C Paste	1,300	....
Helindone Fast Scarlet R Paste	550	....
Helindone Golden Orange IG Dbl. Pst.	5,000	....
Helindone Golden Orange IRRT Pst.	6,010	....
Helindone Orange D Paste	25	....
Helindone Orange R 10% Paste	325	....
Helindone Pink AN Paste	3,803	....
Helindone Pink B Extra	150	....
Helindone Pink BN Extra Paste	1,620	....
Helindone Pink R	200	....
Helindone Pink R Extra	13,261	....
Helindone Red 3B Paste	5,050	....
Helio Bordeaux BL Powder	1,284	....
Helio Bordeaux BL Powder	784	....
Hydron Brown G Paste	500	....
Hydron Green G Paste	100	....
Hydron Orange R Paste	150	....
Hydron Pink FF Paste	250	....
Hydron Scarlet BB Paste	100	....
Indanthrene Black BB Dbl. Paste	8,500	....
Indanthrene Blue 3G Paste	800	....
Indanthrene Blue 3G Dbl. Paste	500	....
Indanthrene Blue RSP Triple Powder	1,000	....
Indanthrene Bordeaux B Extra Paste	747	....
Indanthrene Brown B Dbl. Paste	500	....
Indanthrene Claret B Extra Paste	1,000	....
Indanthrene Golden Orange G Paste	2,282	....
Indanthrene Golden Orange G Dbl. Pst.	1,500	....
Indanthrene Golden Orange RRT	10,700	....
Indanthrene Pink B Dbl. Paste	780	....
Indanthrene Red BN Extra Paste	2,750	....
Indanthrene Red BN Extra Paste SF.	3,000	....
Indanthrene Red R Paste	490	....
Indanthrene Red Violet RRN Paste	200	....
Indanthrene Scarlet GS Powder	200	....
Indanthrene Violet BN Extra Paste	755	....
Indanthrene Violet RR Extra Paste	100	....
Iris Blue	10	....
Iris Violet Extra	16	....
Janus Black I	10	....
Janus Green B	25	....
Jasmine High Conc	....	3,000
Katigen Green 2G	1,000	....
Kiton Pure Blue V	....	1,100
Lanasol Blue B	....	880
Lanasol Brown 2R	....	660
Lanasol Green G	....	165
Lanasol Orange G	....	1,242
Lanasol Orange RR Pat	....	220
Lanasol Yellow G Pat	....	33
Lithol Fast Orange R Powder	200	....

Designation of Dye	Germany (lbs.)	Switz. (lbs.)
Madder	75	....
Madder Lake (from England 10,000 lbs.)	2,450	....
Malta Gray B (from France 1,100 lbs.)	....	....
Malta Gray J (from France 1,100 lbs.)	....	....
Metachrome Blue Black 2BX	1,000	....
Methyl Lyons Blue	....	3,000
Methyl Violet NFB	50	....
Modern Violet N	....	220
Monochrome Brown BX	110	....
Napthamine Fast Black KSG Extra	250	....
Napthamine Fast Black KSV Extra	250	....
Napthamine Fast Blue JEF	8,000	....
Napthamine Light Blue 4B	100	....
New Ethyl Blue BS	105	....
New Methylene Blue N	50	....
Night Blue	150	....
Nile Blue A	10	....
Oxamine Acid Brown G	1,050	....
Palatine Light Yellow RX	500	....
Paper Fast Bordeaux B	300	....
Patent Phosphine M	....	4,800
Peacock Blue Lake	6,250	....
Phosphine 3R	1,000	....
Pluto Brown 2G	340	....
Polar Maroon V Conc	....	1,000
Polar Yellow 2G	....	1,000
Pyramine Orange 3G	1,300	....
Pyramine Orange R	215	....
Pyrazol Fast Brown B	....	550
Pyrazol Orange G	....	1,000
Pyrogene Green 3G	....	2,200
Radio Black SB Pat	100	....
Radio Black ST Pat	100	....
Radio Brown B Pat	100	....
Radio Brown S Pat	100	....
Radio Red C Pat	100	....
Radio Yellow R Pat	150	....
Red Pigment ground in oil (from England 143 lbs.)	....	....
Rhodamine B Extra	300	....
Rhodamine 6GD Extra	100	....
Rhodamine 6GDN	1,000	....
Rhodamine 6GDN Extra	2,500	....
Rhodamine 6GH	....	121
Rosanthrene BN	....	1,370
Rosanthrene GWL Extra Conc	....	660
Rosanthrene Bordeaux BL	....	660
Rosanthrene Bordeaux 2BL	....	440
Rosanthrene Fast Red 7BL	....	33
Rosanthrene Rose	....	220
Rosanthrene Orange R	....	550
Rosanthrene Red 7BL	....	220
Rose Gerancine (from France 11 lbs.)	....	....
Rosinduline 2B Bluish	30	....
Rosinduline GXF	500	....
Solidred	5,000	....
Soluble Blue IN	500	....
Sulpho Rhodamine BG	500	....
Sulphon Azurine D	242	....
Sulphon Orange G	100	....
Sulphon Yellow 5G	50	....
Thioflavine T	200	....
Thioflavine TCN	302	....
Thio Indigo Rose BN Paste	1,000	....
Thio Indigo Rose BN Extra Paste	1,000	....
Thio Indigo Rose RN Extra	500	....
Thio Indigo Scarlet 2G	600	....
Thionine Blue GO	400	....
Thionine Blue GO	....	880
Thionol Brown O (from England 6,000 lbs.)	....	....
Thionol Green DY (from England 2,000 lbs.)	....	....
Trisulphon Brown B	....	12,000
Trisulphon Brown B Conc	....	5,000
Trisulphon Brown GG	....	2,500
Ultramarine Blue (from France 100 lbs.)	....	....
Ursol A	200	....
Ursol DF	200	....
Ursol 4R	200	....
Ursol Gray ALA	100	....
Vat Pink B Extra Paste	3,700	....
Wool Black GRF	2,720	....
Wool Black N	100	....
Wool Fast Blue BL	100	....
Wool Fast Blue GL	260	....
Rubylake	25	....

Totals:

Germany	238,174 lbs.
Switzerland	212,830 lbs.
England	13,543 lbs.
France	2,311 lbs.

The process by means of which green carnations are made available along about March 17 each year has been elaborated by a German named Reinmann, who claims to be able to dye living plants, even trees, to any desired color. The dyeing process requires about forty-eight hours.

Aniline dye is used, and 50 grams of it, together with 200 liters of water, are sufficient for one tree. Final tests were made in the forest of Tharandt, in the presence of a representative of the Saxon Government and a number of experts.

Dresden firms have undertaken to exploit the patent. Furniture, cigarette cases, pen holders and other articles are to be put on the market, all made up in the new colored wood.

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Chrome Fast Brown M P
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Newport Anthrene Yellow R	Newport Anthrene Dark Blue BO

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